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COAST GUARD POLAR ICEBREAKING OPERATIONS

HEARING

BEFORE THE

SUBCOMMITTEE ON MERCHANT MARINE

OF THE

COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION

UNITED STATES SENATE

NINETY-EIGHTH CONGRESS

SECOND SESSION

ON

COAST GUARD ICEBREAKING OPERATIONS
IN THE POLAR AND NEAR POLAR REGIONS

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COAST GUARD POLAR ICEBREAKING OPERATIONS

WEDNESDAY, APRIL 11, 1984

U.S. SENATE,
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION,
SUBCOMMITTEE ON MERCHANT MARINE,
Washington, D.C.

The subcommittee met, pursuant to notice, at 10:10 a.m., in room SR-253, Russell Senate Office Building, Hon. Ted Stevens (chairman of the subcommittee) presiding.

Staff members assigned to this hearing: David Dye, staff counsel and James Drewry, minority staff counsel.

OPENING STATEMENT BY SENATOR STEVENS

Senator STEVENS. We are meeting today to examine the Coast Guard's icebreaker operations in the polar and near polar regions. These specialized vessels play key roles in maritime commerce, scientific research, and national security.

In 1965, the Navy transferred control of its icebreakers to the Coast Guard, making it the sole Government agency to operate this kind of vessel. Along with the transfer of the vessels, the Coast Guard assumed the Navy's mission in the polar regions, including resupply of early warning, weather, and radar stations in Alaska, Canada, and Greenland.

In 1971, Coast Guard was directed to provide icebreaker services to the National Science Foundation for the Antarctic program. In addition to these special mandates, polar icebreakers support the Coast Guard's traditional missions such as search and rescue, environmental protection, enforcement of law and treaties, and aids to navigation.

The current polar icebreaker fleet consists of five vessels. The two *Wind* class icebreakers that are now over 40 years old and approaching the end of their useful lives. The *Glacier* is nearly 30 years old. Two *Polar* class icebreakers are relatively new, but had propulsion system design problems which affected performance in the first years of their service.

We question how long this rapidly aging fleet will be able to perform the duties of the Coast Guard. I believe that we must begin now to define our immediate and long-range icebreaking needs. In addition, we must decide on what resources are necessary to do the job. We hope to explore the most appropriate roles for both government and industry to meet the important national objectives in this field.

Today we have witnesses from the Coast Guard, the Navy, other Federal agencies that use icebreaker services, as well as the commercial, offshore drilling, and marine transportation industries.

We are happy to have, as our first witness, the Commandant of the Coast Guard, Adm. Jim Gracey. Jim, would you identify those who are with you, for the record please.

STATEMENT OF ADM. JAMES S. GRACEY, COMMANDANT, U.S. COAST GUARD, DEPARTMENT OF TRANSPORTATION, ACCOMPANIED BY VICE ADM. BEN STABILE, VICE COMMANDANT, AND REAR ADM. NORMAN VENZKE, CHIEF OF OPERATIONS

Admiral GRACEY. Yes, Mr. Chairman, thank you.

I have with me my Vice Commandant, Vice Adm. Ben Stabile, and my Chief of Operations, Rear Adm. Norman Venzke.

With your permission, sir, I will summarize my opening statement and then provide the full statement for the record.

Senator STEVENS. Please, that would be very fine. Thank you, Admiral.

Admiral GRACEY. Polar ice operations are carried out under the provisions of title 14 of the United States Code. The icebreaking mission in the polar regions is in pursuit of the Presidential memorandum of February 5, 1982, on Antarctica and national security decision directive 90 of April 14, 1983, for the Arctic.

The United States has a strong interest in the polar regions. The Arctic and Antarctic policies that I just mentioned define those interests and emphasize the growing importance of the polar regions to our Nation. The Coast Guard is responsible for maintaining America's icebreaking fleet, which is vital in projecting U.S. presence into the polar regions whenever and wherever necessary in support of the national interest.

Besides being available for a full range of Coast Guard missions, the polar icebreaker fleet accomplishes many tasks for other agencies as well. For example, in the Antarctic: Logistics and supply of U.S. scientific stations, oceanographic research, and support of Department of State inspections of foreign scientific stations as provided for in the Antarctic treaty. In the eastern Arctic: Logistics and supply of the defense facilities and classified oceanographic research. In the western Arctic: Environmental assessment programs, maritime transportation feasibility studies, and classified oceanographic research.

This list is by no means all inclusive. In addition, polar icebreakers are indispensable during national emergencies, wartime contingencies, or any need involving activities in the ice.

The U.S. icebreaker fleet, all of which is operated by the Coast Guard, consists of two *Polar* class ships, *Polar Star* and *Polar Sea*. As you noted earlier, Mr. Chairman, they were commissioned in the mid-1970's. It also consists of *Glacier*, which was commissioned in 1955, and two *Wind* class cutters, *Northwind* and *Westwind*, which were commissioned in the mid-1940's.

I have two major concerns about the state of our current polar icebreaking program. First, the age of the three older vessels is causing costly reliability and maintenance problems. The effects of

fleet aging are most manifest in declining reliability and limited capability.

The plan is to alleviate these deficiencies during the next few years by developing an icebreaker replacement program for future consideration in the budget process. The ultimate plan will be guided by the outcome of an interagency study due to be completed this spring. The study was undertaken in recognition of the need to move quickly in the program with the goal to have operational in the early 1990's the types of vessels needed to meet the U.S. polar policy objectives.

My second concern is the funding arrangement, which finds the Coast Guard a minority stockholder in its own fleet. Spreading all costs, including fixed costs for crews, maintenance, and so forth, among user agencies complicates the management of these unique management assets. Alternatives that may be available to deal with this are being reviewed by the interagency study group I mentioned earlier as part of the study that we expected to be completed this spring.

Mr. Chairman, this completes my opening remarks and I will be happy to answer your questions.

Senator STEVENS. Admiral, one of the problems that I think is giving us what I would call an improper perspective of the Federal funding for icebreakers is the change in the user fees for the Federal agencies. When was that change made?

Admiral GRACEY. It started with the fiscal year 1983 budget, Mr. Chairman.

Senator STEVENS. When that was done, as I understand it, the user agencies, such as the Department of Defense, the National Science Foundation, and MarAd, no longer had to pay a share of the cost of operating the icebreakers. Is that right?

Admiral GRACEY. No, sir, that is not correct. What happened was that at that time all of the costs of the icebreaker fleet were divided among the various agencies commensurate with the level of their activities. That included the fixed costs for crews, and so forth. The effect being that, as I mentioned, the Coast Guard is a minority stockholder in its own fleet.

The Navy, for example, funded $10.8 million in fiscal year 1983. The NSF had a larger figure. Their shares are proportionate to the amount of time to be spent on the work they have, and the degree to which they want to budget.

What happened was that the funding that was in the Coast Guard at the time was split among these different agencies, that is, the base funding. Prior to that time, since about 1977, we had been charging only variable costs, the actual costs of a mission, the fuel costs, and so forth, expended on a mission. The fixed funding was with the Coast Guard entirely.

Senator STEVENS. Did that reduce the level of funding of the Coast Guard and increase the level of funding of the user agencies?

Admiral GRACEY. At the time, Mr. Chairman, it took the money that was in the Coast Guard budget and split it proportionately. It left us with about 15 percent of the funding.

Senator STEVENS. As a consequence, the users have not paid the same operational support for the icebreakers?

Admiral GRACEY. The effect of this, Mr. Chairman, is that they are paying proportionately as they did before, only at this point they are funding even more. We now have the budgeting for the polar icebreakers split among several appropriations and several oversight committees that oversee the various agencies involved.

Each agency acts on its priorities according to what those priorities are. If one has a change of heart about a priority at a given time, then it is entirely possible, as happened last year, that an icebreaker funding will disappear, and we will have to take the action to lay up the icebreaker for that year.

The effect of this is management by committee. We have an interagency group that manages the fleet. We are responsible for the fleet, but we work through and with an interagency group composed of the National Science Foundation, the Navy, the Coast Guard, and so forth. They determine the priorities, and they make budget decisions, and that sort of thing.

Senator STEVENS. Does MarAd still pay a portion of the fleet operation?

Admiral GRACEY. They dropped out last year. They were in for about $5 million, and their priorities at the close of the budget season were such that they had to pull that back. So at the moment, they are not in. They do participate with us, though.

Senator STEVENS. At the time the funding level was distributed among the user agencies and the Coast Guard, they received a portion of that funding base, did they not?

Admiral GRACEY. It is distributed now, Mr. Chairman. Do you mean MarAd?

Senator STEVENS. Yes.

Admiral GRACEY. Yes; that is right. When the original distribution was made, for instance, in fiscal year 1983, Marad had $4.5 million for fixed costs and $1.2 million for deployment costs. Incidentally, the $4.5 million was exactly the figure the Coast Guard had involved, and their operating costs are about double the amount that the Coast Guard has.

Senator STEVENS. I tried to get to this through the Senate Appropriations Committee last year, and we suggested some changes. Why haven't those changes been pursued?

Admiral GRACEY. Are you referring to the capital fund, sir?

Senator STEVENS. Yes.

Admiral GRACEY. At the time the 1984 Appropriations Act was finally enacted, those provisions were not in the bill.

Senator STEVENS. They are in the report.

Admiral GRACEY. Yes, sir, I understand they are in the committee report.

Senator STEVENS. They are not in the bill, but they are in the report.

Admiral GRACEY. That is one of the issues the study group is addressing, sir, the alternative ways to fund. This is one matter the study group is considering at this point.

Senator STEVENS. How far along is that study now?

Admiral GRACEY. We had hoped to have it finished during this month of April, sir. However, since the final version has not yet hit my desk, I am sure all the decisions to be made and all of the mas-

saging will not be done in April. I am still hopeful it will be done this spring.

Senator STEVENS. How does our icebreaker fleet compare with other nations of the world that have similar operations?

Admiral GRACEY. In terms of size?

Senator STEVENS. In terms of size and age.

Admiral GRACEY. In terms of size, we are considerably smaller than the other fleets, but it depends on the country you are talking about. We have 5, the Soviets have 15, the Canadians have 6, Japan has 2, Argentina has 1, and West Germany has 1.

In terms of age, the median age of ours is 30 years. The median age of the Soviet fleet is 10 years; the Japanese fleet, 10; and the Canadian fleet, 10. Our two *Polars* are 10, and the others, of course, are considerably older as you noted.

Senator STEVENS. The other nations have had a substantial number of additions to their fleet in the last 10 years, and we have had basically two. Is that right?

Admiral GRACEY. That is the way the figures work out, yes, sir.

Senator STEVENS. In 1985, there is a proposal to mothball the *Westwind.* What is it going to cost to mothball the *Westwind,* and why would we mothball it in the first place?

Admiral GRACEY. Actually, Mr. Chairman, our mandate was to decommission one *Wind.* We have not firmly decided that it will be the *Westwind,* but it will be one of the *Wind* class. We have loosely used the term "mothball." Actually, it is going to be put into reserve status.

We think that is going to cost roughly $1 million, and the money we are going to spend to repair the damage incurred on her last voyage is another $1 million. The reason for decommissioning was a lack of priority for funding.

Senator STEVENS. What would it cost just to keep whichever one it is in a state of readiness, rather than put it away?

Admiral GRACEY. Meaning with a crew aboard, and ready to operate, sir?

Senator STEVENS. Yes.

Admiral GRACEY. It would take about $6,500,000. Personnel costs are $2,500,000. The operating costs are about $3 million; but if we didn't operate, it would be something less than that. So, barebones, let's say, $4 million as an estimate.

Senator STEVENS. How many crews do you have for these icebreakers?

Admiral GRACEY. We have one for each icebreaker now, Mr. Chairman. When the *Polars* were built, our plan was to have three crews for two ships, the idea being that we could then get 245 operating days a year out of each of those hulls. Our operating time now is human-constrained to 185 days a year away from homeport.

That plan was to be executed in Seattle, and we built an icebreaker support facility to handle it, or we have provision for that. It was never executed, partly because we were having engineering problems, as you noted, with the propeller system, which is incidentally a unique design in the world. There was just no way we were going to get the operating time those crews were to provide then. We have overcome those problems at this point, but there are still a couple of other things to be done.

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For all the ships right now, we have one crew per ship.

Senator STEVENS. How does the manning of your icebreakers compare to the naval manning of their vessels that are in the various groups, like the carrier groups?

Admiral GRACEY. I will have to give you a two-part answer to that, Senator.

First, let me tell you that our icebreakers are manned by standards which make them effective as military vessels. They are not up to wartime standards, however. So, to the extent that a Navy carrier group is in a forward position, and would be up to wartime standards, then it would be more heavily manned than these icebreakers are. They are not manned to wartime standards, but they are manned to military standards, which makes the manning fairly heavy.

I have to be careful in saying "manning," because we have women going to sea on those ships, too. In addition to that, one of the things that makes them personnel intensive, and they are, the older ones, is that it is the way they were built. They were not built with all of the automation and that sort of thing that we can have today.

Our *Polar* class ships, proportionately, have a considerably lower personnel level. Part of that was due to a maintenance concept which would have had the maintenance work done in Seattle by backup maintenance crews.

Senator STEVENS. Do you have another class of icebreakers in the planning stage now?

Admiral GRACEY. Not in the planning stage, Senator. We did, a couple of years ago, go through an exercise with a dual draft icebreaker which would have been suitable for operation in shallow draft or deep draft. One of the things we had in mind was operating in the Great Lakes in the winter, and elsewhere in the summer. That design was completed, but we did not go forward. It was decided that it was not an effective way to go.

What we have, rather than call it a plan, I think we would call it a gleam in our eye as far as replacement icebreakers for the older fleet. The number we would have to talk about will depend on the outcome of the study and, more than that, the ultimate high level decision that will be made in terms of the size of America's icebreaker fleet. That is the basic decision that governs a lot of what we are talking about.

We have a concept, and the concept is that we would replace whatever number—some of them have to be replaced—and they wouldn't be up to the *Polar* class. I don't think we would have to build anything to the *Polar* class, but something between that and the *Wind's.*

Senator STEVENS. How much did the *Polar* class cost us?

Admiral GRACEY. They cost, at the time they were built, about $60 million, if I remember the figure.

Senator STEVENS. Do you have any estimate of what they would cost to build now?

Admiral GRACEY. To build a *Polar,* sir?

Senator STEVENS. Yes.

Admiral GRACEY. I heard an estimate, and I don't believe it, Senator. The estimate that I have before me is that in 1982 dollars, it

would be about $146 million. The vice commandant and I have been talking about this in the last while, the bottom line is that we really don't know, but we are thinking in the ballpark of somewhere about $200 million, depending on what we have in the way of automation.

What we would do is make these highly automated so they could be relatively low crewed. They would be much better research platforms. We would put much better research space in them, and that sort of thing.

Senator STEVENS. My staff tells me that the West German Government built a new icebreaker, the *Polar Stern*, and it cost $80 million. It has a crew of 42, and room for 70 scientists aboard. How does that compare to our icebreakers?

Admiral GRACEY. It is very difficult to compare them, Senator, but I will try.

First, I want to point out that the figure we have for the construction costs for *Polar Stern* is about $95 million in 1982 dollars, comparing it to the *Polar* class which I just cited as $146 million, but of significance, I think, is that the operational cost of *Polar Stern* for 1983 was greater than the operational cost of our *Polar* class.

While it is a smaller vessel, very specialized, very limited capability except for research, it actually cost about $650,000 more to operate in 1983 than it cost us to operate the *Polar* class, and that is with a much smaller crew.

Other differences are, of course, that the *Polar* class is multimission. We can do anything that has to be done, and we can do it wherever it needs to be done. They are among the four or five top icebreaking ships in the world. Incidentally, they have power equivalent to some of the leading Soviet ships with comparable icebreaking capability, but they are considerably smaller and considerably cheaper to build. The tonnage was something around almost half the tonnage of the Russian ships that do have the same icebreaking capability.

Senator STEVENS. When you gave me the number of the Russian ships, did that include their naval as well as their coast guard?

Admiral GRACEY. They don't really have a coast guard, Senator. That is their polar icebreaking fleet. They have, in addition to that, a whole raft of vessels. Their sub-Arctic fleet includes 34 more vessels than the 15 I cited. They are an icebound nation, but that is considerably larger.

Senator STEVENS. When you were before the House committee, I understand you mentioned a concept that you may start charging user fees for domestic icebreaking. Could you tell us about that?

Admiral GRACEY. Yes, sir. What I was talking about was in line with an overall Department of Transportation proposal to use the authority which exists in title 31 of the United States Code for charging for direct measurable services to specific, identifiable users.

One of the things we talked about charging for would be some domestic icebreaking. This has not been firmly worked out yet, but it would be in waters which are normally ice-covered in the winter and to respond to a specific request. General channel clearing would not be charged.

There is some icebreaking we would do that would not cost—for example. Icebreaking in areas that are not normally covered by ice in the winter, but have a bad winter, where you couldn't expect people to have their own capability, or to have somebody in business to provide it, search and rescue, preventing floods, research and development. Those kinds of things would obviously be done without charge.

Senator STEVENS. It would, I assume, involve charging, for instance, if the barge train to Prudhoe Bay got iced in and you went up there. Is that right?

Admiral GRACEY. No; I don't think that would be considered domestic icebreaking, Senator. That is probably an issue that will have to be tussled out at the time. As a matter of fact, in that case, no, because it would be an emergency situation, and we wouldn't charge for that.

Senator STEVENS. It would not cover emergency situations. It would cover just routine clearing. When is taking people out of an ice pack situation, or a stranded vessel in an ice pack, not an emergency?

Admiral GRACEY. It is not in that kind of a situation, Senator. The kind of situation we are talking about is someone in a northern port, let's say, a Great Lakes port, to make it simple, who wants to move a cargo of cement—that is going to make the cement people angry at me, but it is the first example that comes to mind—in the wintertime. He wants to do it in an area of the Lakes that is frozen every year. We would say to him, "Fine. Pay us, or pay somebody else. We will take you through, but pay us." If he is stuck in an emergency situation, then there would be no charge.

Senator STEVENS. Have you got any idea of how large the domestic commercial icebreaking capability of this country is?

Admiral GRACEY. It is not very large at the moment, sir. There are tugboats that do some work. I am not talking about Crowley going to Prudhoe Bay, or companies that service the North Slopes and that sort of thing. There is a lot of capability there. We are talking about those that handle it around port facilities and so forth.

There is no commercial icebreaking capability per se. There are ice capable ships, and there are ships that can handle themselves in ice. In Canada, there are commercial icebreaking ships, which are incidentally subsidized by the government through tax breaks; But to my knowledge, we have none like that.

Senator STEVENS. Let me see if I can summarize the way I see this. We have a situation now where we have two vessels that are roughly 10 years old, two that are approximately 40 years old, and one other that is in-between. Is that right?

Admiral GRACEY. That is correct, sir. One is about 30.

Senator STEVENS. It takes about 5 or 6 years to get a new class going?

Admiral GRACEY. From the beginning of design concept through funding, and the whole business, yes, sir, I would say at least 5 years. Admiral Stabile, my resident expert, tells me that it is more like 7 to 8 years.

Senator STEVENS. I was going to say, I think that the recent vessels probably took longer than that, perhaps 8 to 10 years. So even if we started now, our 10-year-olds would be 20 years, and our 40-year-olds would be gone. They are not going to last 60 years, are they?

Admiral GRACEY. I hope not, Senator. No, sir, they won't. We are pouring good money after bad trying to keep them operating. We think we can run them for another 5 years, perhaps, if we do some major work on them.

Senator STEVENS. Do you believe that the Nation needs an icebreaking capability?

Admiral GRACEY. Yes, sir.

Senator STEVENS. Is this fleet sufficient to meet our needs now?

Admiral GRACEY. Marginally. I think probably the answer would have to be, no, in terms of capability. In terms of numbers of ships, I am not in a position to say that at the moment, Senator, because I have not had a chance to review the work of the study group.

Senator STEVENS. You don't have any money in the budget now to commence the planning of a new class of icebreakers, do you?

Admiral GRACEY. No, we don't, Senator. At this point, it is too early for us to have that funded. We would normally start doing some basic work in-house to rough out the concepts, and then we would start spending money for design work. We have been holding back pending the basic decision as to how many ships America is going to have.

Senator STEVENS. Your authorization bill is still in committee, and I am always criticized for putting Coast Guard money into the defense budget, so let me put it to you here in this committee, rather than there. I request that you give me the figures to initiate the design of a new class of icebreakers. As I understand OMB policy, you can't refuse.

Admiral GRACEY. I like that offer that I can't refuse, Senator.

Senator STEVENS. I would like to have that, and I think that we should have the figures that are necessary to initiate that and put it in the authorization for your budget. I would not feel constrained at all to attempt to put in the defense budget again, if that is necessary, but I think that it would be better to see if we can take on OMB in the normal channels.

I understand that you have a design study in your authorization bill, and that is not what I really want. I would like to see us initiate the design phase of a new class of vessels. I don't think that we need another study. Is that going to put you in the frying pan, Jim?

Admiral GRACEY. I am accustomed to being there, Senator, so it is OK. The reference to a study is talking to preliminary design detail as opposed to going out for further study. Actually laying lines down on paper, I think that is what we are talking about.

Senator STEVENS. I read between the lines that that is not really getting started. Am I wrong?

Admiral GRACEY. No; you are right, sir.

Senator STEVENS. I would really like to see us get started with this concept of a new class of vessels.

Admiral GRACEY. I made reference to the study that is going on, Senator. There is no question, from what I understand, that there

will be some of the old fleet replaced. So it is not inappropriate to get started on this.

Senator STEVENS. I appreciate your courtesy.

I see that Senator Warner is here.

Do you have questions of the Coast Guard, Senator Warner?

Senator WARNER. Thank you, Mr. Chairman.

Admiral.

Admiral GRACEY. Senator.

Senator WARNER. Mr. Chairman, I am here representing the Senate Armed Services Committee to state our unequivocal support from a national defense perspective for the initiation of the proposal just mentioned by the chairman, namely, the commencement of a new class of icebreakers.

I have a table, which I would like to submit for the record, showing the aging worldwide of icebreaker fleets. In a quick comparison, the United States has 5, and the median age is 30 years; the Soviet Union has 15 icebreakers, median age is 10.

AGES OF POLAR ICEBREAKER FLEETS

	Number of polar icebreakers	Median age
Country:		
United States	5	30
U.S.S.R.	15	10
Japan	2	10
Canada	6	10
Argentina	1	5
West Germany	1	2

Senator WARNER. Mr. Chairman, as you well know from your study of national defense perspectives, the fleets of the world are looking more and more to the polar regions for operational areas. As such, it is the view of the Committee on Armed Services that the United States should have a sufficient capability in the field of icebreaking. We will not achieve parity in any sense with the Soviet Union or equivalence, but if we can get a start that is essential.

Thank you, Mr. Chairman, and I will submit other points for the record, and I commend the admiral.

Senator STEVENS. We welcome your support.

Senator WARNER. It is a pleasure to be back to my old committee. I get homesick sometimes.

Senator STEVENS. Thank you, John.

Senator WARNER. Thank you, Mr. Chairman.

Senator STEVENS. I do thank you very much for your testimony and your support. We would like to make certain that this fleet does not deteriorate, and that we are conscious of an effort to move ahead to replace the aging portions of it, Admiral.

Admiral GRACEY. Thank you, sir.

Senator STEVENS. I thank you and your staff very much.

[The statement follows:]

STATEMENT OF ADM. JAMES S. GRACEY, COMMANDANT, U.S. COAST GUARD, DEPARTMENT OF TRANSPORTATION

POLAR ICE OPERATIONS—MANDATE/PROGRAM DESCRIPTION

The 1965 Memorandum of Agreement between the Department of the Navy and the Department of the Treasury on the operation of icebreakers assigned the Coast Guard sole responsibility for operating the nation's polar icebreaker fleet. Two recent Presidential documents define United States national polar interests and emphasize the growing importance of the polar regions to the nation. A memorandum dated 5 February 1982 on U.S. Antarctic policy and programs states that this nation shall maintain "an active and influential presence in Antarctica designed to support the range of U.S. Antarctic interests" and tasks the Coast Guard (DOT) with logistic support of the Antarctic program. National Security Decision Directive 90 (NSDD 90) dated 14 April 1983, recognizes the Arctic's importance to national security, resource and energy development, and environmental protection. The Coast Guard maintains the United States' sole polar surface maritime capability necessary to project into the polar regions whenever we want in support of the national interest.

Agencies using icebreaker services fall into two categories: primary users, which require icebreaker services annually; and occasional users. The primary users are the Coast Guard, Department of Defense (DOD), and National Science Foundation (NSF). Occasional users include the Maritime Administration (MarAd), National Oceanic and Atmospheric Administration (NOAA), Department of Energy (DOE), Department of Interior (DOI), and the National Academy of Sciences (NAS).

The polar icebreaker fleet accomplishes Coast Guard missions in polar regions and supports a variety of Coast Guard programs. Traditional Coast Guard missions carried out by polar icebreakers include search and rescue, law enforcement, aids to navigation, and marine environmental response. Another identifiable part of the Coast Guard requirement is maintenance of a military readiness capability to be provided to the Navy during national emergencies.

Polar icebreakers support DOD activities and programs in the eastern and western Arctic. Resupply of Defense Early Warning (DEW) Line sites in the western Arctic is primarily a tug and barge operation requiring ice-breaking services only if difficulty with ice is encountered. Icebreakers conduct classified research in the Bering, Chukchi, and Beaufort Seas almost every year in both winter and summer.

In the eastern Arctic, resupply of defense bases is conducted during the months of July, August, and September by the Military Sealift Command. The sealift involves both tankers and breakbulk cargo ships. Bases at Goose Bay, Canada; Thule and Sondrestrom, Greenland; and DEW line sites at Quaqatoqaq and Kulusuk, Greenland are supplied by these ships. During the resupply operation and transit the supply ships operate in icecovered waters, particularly around Thule and Kulusuk. The supply vessels generally require icebreaker escort to insure safe passage. This escort is performed by either breaking out a channel for vessels to follow, or actually towing the escorted vessel through the ice. The 1983 resupply effort required *Northwind's* support for 30 days longer than the normal 30 days due to heavy ice conditions along Greenland's west coast. Icebreakers also conduct classified oceanographic research around Greenland and north of Iceland. When conducting classified research, emergency submarine tending, and wartime contingencies in high latitudes, DOD can only depend upon Coast Guard icebreakers.

Icebreakers play a key role in the logistic support of the United States Antarctic Program administered by the National Science Foundation. Ships chartered by the Military Sealift Command supply the U.S. base at McMurdo once annually. Although the supply ships are ice-strengthened, icebreakers are required to cut and clear a channel through heavy concentrations of fast pack ice. Icebreakers also serve as research platforms and have made possible some research projects which could not have been accomplished in any other way (e.g. the Weddell Sea Oceanographic Expedition). Icebreakers also perform a variety of other tasks incidental to their primary ice operations or science assignments. These include refueling stations, transporting cargo and personnel (for instance to Palmer Station), providing helicopters for logistics and science, and giving maneuvering assistance to supply ships. Icebreakers also support Department of State inspections of foreign stations as provided for in the Antarctic Treaty, a function recently accomplished during *Polar Star's* circumnavigation of the continent in 1983.

Occasional users also require polar icebreakers, primarily for research support. Examples include the MarAd western arctic trafficability studies and the joint DOE/DOI sponsored Outer Continental Shelf Environmental Assessment Program, for which NOAA is the primary facilitator.

The following operations are projected for fiscal years 1984 and 1985:

Fiscal year, agency, and location	Planned days in operating area	Purpose
1984: NSF, Antarctic	[1] 150	Logistics, research; 2 ships.
1984: CG, Antarctic	5	Research-ship design.
1984: DOD (Navy), East Arctic	43	Fleet exercises.
1984: CG, West Arctic	[1] 21	Research-ship design.
1984: MarAd, West Arctic	[1] 9	Research.
1984: DOD (Navy), East Arctic	74	Logistics, research.
1984: DOD (Navy), North Atlantic	32	Fleet exercises.
1984: NAS, West Arctic	30	Research-ship design.
1985: NSF, Antarctic	133	Logistics, research; 2 ships.
1985: DOD (Navy), West Arctic	27	Research.
1985: CG, West Arctic	43	Law enforcement.
1985: DOD (Navy), North Atlantic	18	Fleet exercises.
1985: CG, North Atlantic	30	Logistics.
1985: DOD (Navy), West Arctic and East Arctic	67	Research.

FACILITIES—COMPARISON WITH WORLD'S ICEBREAKER FLEET

The nation's polar icebreaker fleet consists of five ships: two *Polar* Class—*Polar Sea* and *Polar Star; Glacier;* and two *Wind* Class—*Northwind* and *Westwind.* Their prominent characteristics and capabilities are summarized on the table which follows along with statistics for the entire world fleet of polar icebreakers. The Soviet Union operates 15 (three of which are nuclear powered) of the 30 polar icebreakers in the world today. The United States polar icebreaker fleet is, by a wide margin, the world's oldest, with a median age of 30 years. In contrast, the Soviet and Canadian fleets each have a median age of ten years. In terms of capability, the *Polar* Class compares very favorably with the world's fleet. *Glacier, Northwind,* and *Westwind,* however, fall substantially below present day icebreaker standards, primarily because of outmoded systems and deteriorating material condition.

FACILITIES—PRESENT STATUS

The *Polar* Class are now fully mission capable. The ships have experienced various engineering reliability problems since their commissionings; however, this reliability is continuously improving as we find specific solutions to the early engineering problems. The major problem now is longitudinal shaft vibration while ice breaking. Other *Polar* Class problems include upgrade of the main propulsion console (for which we received AC&T funding in FY84), and reduction gear problems (we will conduct calibration tests for *Polar Star*'s reduction gears this winter in the Bering Sea). Recent *Polar* Class accomplishments include: continuation of environmental ship design data collection in the Arctic (during *Polar Sea*'s Arctic West Winter 83); significant reduction of McMurdo Sound break-in, where one *Polar* Class icebreaker can accomplish the task in half the time required by two *Wind* Class icebreakers; and, first circumnavigation of Antarctica within 60 degrees South latitude by a U.S. icebreaker (*Polar Star* during Deep Freeze 83).

Glacier entered a major maintenance availability (MMA) in May 1983 at a planned cost of $12.57 million ($7.27 million AC&I and $5.3 million OE). The MMA, however, cannot be viewed as a "life extension" project, but rather as corrective action to bring the ship to acceptable operational standards and provide a service life into the early 1990's. The scope of the MMA is as follows:

Improvements to watertight integrity and structural repairs

Replacement of certain watertight doors and hatches.
Renew wasted deck (under wood decking).

Machinery overhauls and replacement

Overhaul all ten main generators.
Overhaul coolers on all ten main generators.
Overhaul blowers on all ten main diesel engines.
Replace all four ship's service generators and voltage regulators.

Renew evaporator.
Overhaul bilge drainage system.
Overhaul seven main diesel engines.

Safety improvements

Install additional lighting.
Renew ventilation system in paint locker.

Mission equipment overhauls

Overhaul cranes.
Overhaul oceanographic winches.
Overhaul boat davits.

Berthing rehabilitation

Expand and upgrade scientific berthing areas.
Renovate some heads.

Drydocking

Remove and inspect shafts.
Remove and inspect propellers.
Renew stern bearings if beyond tolerances.
Renew zincs.
Touch up inerta bottom coating where needed.

The MMA will be completed this summer. During fiscal year 1985, *Glacier* will shift homeports from Long Beach, CA to Seattle, WA due to the high cost of mooring the ship in Long Beach (gratis Navy berthing is no longer available and Coast Guard mooring is available in Seattle) and the availability of the Coast Guard Icebreaker Support Facillty in Seattle.

The *Wind* Class are 40-year old hulls which require timely replacement. The Coast Guard re-engined these ships in the early 1970's during extended yard availabilities with the intention to operate the vessels until 1981. Three years later, the Coast Guard continues to operate these ships in the remote polar environment. The *Wind*'s are not only aged by U.S. standards, but are by far, two of the world's oldest operational polar icebreakers.

A Ship Structure and Machinery Evaluation Board (SSMEB) conducted aboard *Westwind* in July, 1983, determined that at least $5 million is required to finance the safety and supportability corrective action necessary to operate the ship until 1990–1991, the earliest a replacement icebreaker could be operational. The Board reported the following major deficiencies:

Main propulsion maintenance

Replace main diesel engine lube oil and fresh water coolers with a series of smaller coolers that are accessible for repair and maintenance.

Replace lube oil and fuel oil purifiers with self cleaning models to reduce maintenance manpower requirements.

Replace main engine exhaust coolers.

Auxiliary equipment assigned remaining service life of zero

Steam system.
Ventilation system.
Steering system.
Air conditioning system.
Fire fighting systems.
Food handling and storage systems.
Salt water systems.

Deficient prime mission equipment

Arctic survey boat.
Boat cranes.
Oceanography laboratory air conditioning system.

Structural deficiencies

Lack of longitudinal space in vicinity of deep sea anchor winch room.
Several tripped frames and buckles in the ice-impact area.
Severe deterioration under most interior and exterior deck coverings.

Habitability

General lack of space.
Deficient ventilation and air conditioning.
Overall very poor living conditions.

At the beginning of *Westwind*'s present Deep Freeze 84 deployment, Navy Fleet Training Group Guantanamo Bay Training Assist Team documented serious material conditions. As you will see below, their training and survey proved invaluable on *Westwind*'s subsequent voyage.

Several years ago the Coast Guard conducted an SSMEB on *Northwind* and documented many of the same problems found on *Westwind*. Although progress has been made in correcting *Northwind*'s deficiencies, numerous significant problems remain. It is clear the *Wind* class require extensive work to insure their safe operation until the early 1990's.

WESTWIND CASUALTY

Westwind's problems were recently compounded by a major casualty suffered during Deep Freeze 84. While operating in loose brash in the vicinity of Antarctica's Larsen Ice Shelf, the ice field became extremely pressurized, besetting the ship. The pressure in the ice field forced the ship's port side against a protrusion from the ice shelf, resulting in structural damage above the hull's ice belt. The crew was able to control the flooding and eventually extract the ship. *Westwind* sustained extensive damage to her hull, decks, starboard propeller, steering gear, fuel tanks, and piping systems.

A Coast Guard repair team made temporary repairs in Antarctica. The additional repairs required, if made, will cost an estimated $2.4 million.

POLAR ICEBREAKER REQUIREMENTS STUDY

In its review of the Coast Guard fiscal year 1984 budget request, the Office of Management and Budget (OMB) directed ". . . an Interagency Policy Committee (DOT, MarAd, Coast Guard, DOD, NSF, NoAA, OMB) to develop an analysis of polar icebreaking (sic) requirements for the balance of the century." The Study is proceeding, with a projected completion in April, 1984. The study will make recommendations concerning icebreaker renovation-replacement and appropriate funding methods.

ACQUISITION, CONSTRUCTION, AND IMPROVEMENT (AC&I)

Several years ago, Congress added $20 million to the Coast Guard AC&I appropriation for a "dual-draft" icebreaker to be capable of Great Lakes and polar operation. The Coast Guard had not requested these funds nor was it prepared to acquire such vessels. Funds were reprogrammed when the need and feasibility of the "dual-draft" vessel were not established.

Based on the present condition of the fleet, and consideration of the national interest, the Coast Guard has recommended that *Westwind*, *Northwind*, and *Glacier* be replaced in the early 1990's. Pending outcome of the Polar Icebreaker Requirements Study and a final budgetary determination to replace the vessels, due to design leadtimes, the earliest a replacement program could begin is fiscal year 1987.

FUNDING

Over the years, various methods have been used to finance the polar icebreaker fleet. The Coast Guard funded all costs prior to fiscal year 1977, when House-Senate conferences directed the Coast Guard to bill primary users for the incremental costs of operating in the polar regions. The Coast Guard identified DOD and NSF as the primary users and budget base transfers of $1.8 million to DOD and $0.8 million to NSF were made. Memoranda of Agreement between the Coast Guard and each primary user governed the program. Average annual reimbursement varied between $1.3 million and $2.7 million during fiscal years 1977–1982. In its review of the fiscal year 1983 Coast Guard budget and consistent with a Roles and Missions Study recommendation, OMB directed that primary users share the full direct costs of icebreaker services. The Coast Guard identified $36 million as the direct program costs for polar ice operations. Effective fiscal year 1983, this $36 million was apportioned among DOD, NSF, MarAd (a primary user in fiscal year 1983 only), and the Coast Guard on the basis of historical and projected icebreaker usage, taking into account the fiscal year 1977 transfers. The fiscal year 1977 and 1983 budget base transfers are summarized below:

	Budget base—		1983	Total (1983)
	1977	1983		
NSF	$789,000	$1,211,000	$13,400,000	$14,611,000
DOD	1,793,000	2,755,000	8,000,000	10,755,000
MARAD			5,300,000	5,300,000
CG	−2,582,000	−3,966,000	−26,700,000	−30,666,000
Fiscal year 1983 direct program costs (estimate)				35,754,000
Total budget base transfers (Fiscal year 1983)				30,666,000
Retained by CG to defray CG share of direct program costs				5,088,000

Memoranda of Agreement between the Coast Guard and DOD, NSF, and MarAd govern full reimbursement. Since fleet ownership is now shared, the Memoranda of Agreement establish a Polar Icebreaker Users Council, comprised of representatives from the primary user agencies, to resolve fleet management issues.

Costs are divided into two components under full reimbursement: (1) Fixed costs, which include pay and allowances of icebreaker crews and supporting staffs, parts, maintenance of the ships and aircraft, and some fuel; and (2) deployment operating costs, which are based upon the actual fuel comsumed in the polar regions. Each primary user reimburses the Coast Guard for its share of fixed costs (based on each user's icebreaker usage) early in the fiscal year, and is charged for deployment operating costs on a quarterly basis. Direct program costs for fiscal years 1983–1984 are shown below:

	Fiscal year—	
	1983	1984
Department of Defense:		
Fixed costs	$9,060,000	$9,515,000
Deployment operating costs	1,407,000	[1] 828,000
Total	10,467,000	[1] 10,343,000
National Science Foundation:		
Fixed costs	12,416,000	13,251,000
Deployment operating costs	2,027,000	[1]1,748,000
Total	14,443,000	[1] 14,999,000
Coast Guard:		
Fixed costs	4,515,000	4,859,000
Deployment operating costs	573,000	[1] 607,000
Total	5,088,000	[1] 5,466,000
Maritime Administration:		
Fixed costs	4,515,000	.....
Deployment operating costs	1,174,000	.....
Total	5,689,000	NA
Total program costs	35,687,000	30,808,000

[1] Estimates.

The costs shown are the costs for accomplishing all primary user missions. MarAd's withdrawal from the reimbursable program after fiscal year 1983 (and the loss of its $5.3 million) increases the funding responsibility on the remaining primary users.

The loss of MarAd funding illustrates one of the difficulties of full reimbursement, a system whose fragmented budgetary review could lead to long-term degradation of the nation's sole surface maritime polar capability. The $5.3 million transferred to MarAd in FY83 for icebreaker costs was placed into the MarAd research

and development (R&D) appropriation. In the course of developing the MarAd FY84 budget, it became necessary to reduce the R&D figure by $5 million. Rather than reduce its traditional R&D activities by 50% MarAd had little choice but to forfeit the newly acquired icebreaker funding. No operational shortfall existed in fiscal year 1984 due to *Glacier's* removal from the reimbursable fleet for the MMA.

[The following information was subsequently received for the record:]

QUESTIONS OF SENATOR HOLLINGS AND THE ANSWERS THERETO

Question. According to testimony at this hearing by Crowley Maritime Corporation, a recent study concludes that a class 10 icebreaker, capable of breaking 10 feet of ice in a continuous mode, can be built commercially for about $105 million, considerably less than current Coast Guard projections for a replacement incebreaker. Have you seen this study and do you believe such an icebreaker would meet Coast Guard mission requirements? If you do not believe it will meet requirements, what kinds of capability would have to be added to do so?

Answer. The Canadian Marine Drilling, Ltd. (CANMAR) proposal for an Arctic Shipping Assessment Project gives a general description of a stripped down test version of a class 10 icebreaker. The proposed icebreaker would be built at a cost of $105 million and would only have features essential for testing its ice breaking ability. The CANMAR proposal does not describe the design in detail. It does not give an estimate of power required, type of propulsion plant, manning level, or endurance. Extensive addition to the equipment and possibly major modification of the design would be necessary to meet Coast Guard requirements. Lacking a more detailed specification of the design, we cannot specify how much would have to be added to the CANMAR design. The CANMAR proposed vessel is designed with commercial use in mind and not the mult-mission use typical of a Coast Guard icebreaker. The Coast Guard believes it is highly unlikely that a vessel of the proposed size (160 meters length overall, draft 13 meters, displacement 35,000 long tons) could be built for $105,000,000, or completed in the 18 months estimated design and construction time.

Question. "Continuous mode" and "backing-and-ramming mode" icebreaking were both mentioned in the course of the hearing. Please describe the differences between these modes of operation, as well as any other modes that may be employed. Under what ice conditions are these different modes used? Which modes are viewed essential for Coast Guard icebreaking and why?

Answer. Continuous ice breaking and backing-and-ramming are the only modes of ice breaking used by icebreakers, although there are many variations in tactics that fall within these two broad categories. Ice conditions relative to the capability of a particular icebreaker determine its mode of ice breaking. When the resistance of the ice is relatively low, the icebreaker can break a path through it by continuous application of power. The actual rate of progress of the ship may vary but it continues to move forward. If the resistance of the ice is high, relative to the capability of the particular icebreaker, the ship will not move forward with a continuous application of power. Under these circumstances, the icebreaker makes forward progress by backing-and-ramming. The icebreaker backs a short distance down the path it has already made and then moves ahead through the open water, gaining speed, until it strikes the unbroken ice. This results in the icebreaker moving forward a short distance through the unbroken ice before it again comes to a halt. The force of impact is not the principle mechanism that breaks the ice, the momentum of the icebreaker and the shape of its hull are much more important to the process. The backing-and-ramming process is then repeated, achieving a slow forward progress. All icebreakers resort to backing-and-ramming at some point, depending on their capability. For example the Coast Guard's *Polar* class icebreakers can break ice continuously in ice conditions that require our older *Wind* class icebreakers to back-and-ram. both modes are essential for Coast Guard ice breaking. Backing-and-ramming can be viewed as a tactic that uses ice seamanship to extend the operating range of a given icebreaker.

Question. In general how do icebreaking requirements for Antarctica differ from those in the Arctic? Would it make sense to have icebreakers of one design for the Arctic and another for the Antarctic?

Answer. Ice breaking requirements vary from region to region and season to season within both the Arctic and Antarctic. Requirements for ice breaking depend on the mission profile, the age (hardness), thickness, extent, and pressurization of the sea ice. It is conceivable that a mission in the Antarctic could require the same

type of ice breaking as an Arctic mission and vice versa. Notwithstanding all of this, it is possible to optimize an icebreaker design for a particular type of ice breaking mission. From the perspective of manager of the nation's icebreaking fleet given the high capital cost and small number of vessels involved, it is highly desirable to be able to deploy any U.S. icebreaker to any polar region to perform multiple missions.

Question. The Coast Guard budget contemplates the re-engining of the cutter *Storis*, a shallow draft vessel with some icebreaking capability. In what month and year do you plan to return the *Storis* to operation, and how long an expected life will it have after re-engining? What missions are envisioned for the *Storis* in its deployment, and in what specific locations will it be operating? Please indicate the extent of its icebreaking capacity.

Answer. The plan for re-engining *Storis* envisions returning the cutter to service during the first quarter of FY 1987 and to keep it in service until FY 1995. CGC *Storis* will perform all of the missions carried out by medium endurance Coast Guard cutters, such as enforcement of laws and treaties, search and rescue, and military operations. We plan to operate *Storis* in the Bering Sea and in the North Pacific. The *Storis* can operate in the margin of the Bering Sea ice pack but its ice breaking capacity is measured in inches (18) not feet. The basic design of the *Storis* is such that she cannot be modified to perform polar ice breaking and she cannot be operated safely in heavy polar pack ice.

Questions of Senator Warner and the Answers Thereto

Question. During your FY 1984 Appropriation's hearing and during a recent hearing in the House, you were critical of the funding mechanism under which the Coast Guard icebreaker fleet is maintained and operated. For the benefit of this committee, please describe this system. What problems has this caused the Coast Guard? Is there a better system? The Senate Appropriation's Committee report of last year suggested changes. Are you aware why no action has been taken?

Answer. Full user agency reimbursement was intituted in FY 1983. Primary user agencies (now Department of Defense, National Science Foundation, and the Coast Guard) share all direct operating costs based on agency icebreaker usage. The primary user agencies reimburse the Coast Guard for fixed costs (primarily pay and allowances; maintenance for electronics, vessels, and aircraft; and fuel for transits and operational support), and deployment operating costs (based on fuel consumed during agency missions). Memoranda of Agreement (MOAs) between the Coast Guard and each primary user agency govern reimbursements and establish the Polar Icebreaker Users Council, an informal group to resolve problems beyond the scope of the MOAs.

It is the Coast Guard's responsibility to operate the nation's polar icebreaker fleet to satisfy national interests in the polar regions. Full reimbursement generally complicates fleet management and has the potential to degrade the Coast Guard's ability to meet unforeseen requirements which may be of national interest. Budget review is fragmented among several agencies, appropriations, and committees. As such decisions are made on an individual user agency basis, omitting full consideration of overall national interests. Loss of funding or change in priorities by one agency, even on a short-term basis, has the potential to reduce the number of operational icebreakers in the fleet. The program lost Maritime Administration funding of $5.3 million in FY 1984 and beyond, requiring placement of a *Wind* class icebreaker in caretaker status in FY 1985.

Fleet management is not a top-level priority of the other primary user agencies, nor should it be since the Coast Gaurd operates the fleet. It is more difficult for occasional users to compete for icebreaker time since they are not funded to pay fixed costs. The Coast Guard has found that an inordinate number of personnel hours and disproportionate managerial attention are required to administer the program.

The Coast Guard believes a better system would be to charge icebreaker users for deployment operating costs only, with all fixed costs in the Coast Guard budget.

As enacted, the final Department of Transportation FY 1984 Appropriations Act included no provisions for alternative funding of polar icebreaking. This is one of the issues the current Polar Icebreaker Requirements Study will address and it is possible that alternative funding recommendations will result.

Question. How capable is the Coast Guard for performing all foreseeable icebreaker missions?

Answer. The Coast Guard is presently marginally capable of performing all foreseeable missions due to overall fleet age and declining reliability. The age and declining reliability of *Westwind* (40 years), *Northwind* (39 years), and *Glacier* (29

years) limits the Coast Guard's ability to project U.S. presence into the polar regions at will and places the U.S. significantly behind other countries in terms of ability to operate in the polar regions. Recent Ship Structure and Machinery Evaluation Boards on *Westwind* and *Northwind* documented numerous serious deficiencies.

If a *Wind* class is decommissioned in FY 85, there will be less backup contingency for casualties to other ships. This is the same condition in terms of operational hulls (4) that the Coast Guard experienced in 1984.

Senator STEVENS. The next witness is Commodore John Seesholtz, the Oceanographer of the Navy, and the Director of the Oceanography Division of the Department of the Navy here in Washington.

Commodore, would you please identify the officers with you, and we will be pleased to have your statement.

STATEMENT OF COMMODORE JOHN R. SEESHOLTZ, OCEANOGRAPHER OF THE NAVY, AND DIRECTOR, NAVAL OCEANOGRAPHY DIVISION, DEPARTMENT OF THE NAVY

Commodore SEESHOLTZ. I am Commodore Seesholtz, the Oceanographer of the Navy. With me is Commander Rudolph who coordinates within my office the polar programs that we run, particularly the use of icebreakers. I have also Lt. Comdr. Ron Fauquet, who had done this in the past, and also looked after other Arctic-related matters.

With your concurrence, I will read a summary of the statement, and provide the full statement for the record. I will cover the highlights in a summary.

Senator STEVENS. Thank you.

Commodore SEESHOLTZ. The Navy's association with the Coast Guard continues to be outstanding. The Navy acts as the executive agent for icebreaker services for the Department of Defense, and coordinates all support requirements. The Department of Defense icebreaker services are required for logistic support of Greenland bases, classified research, and fleet exercise support.

Our annual requirements range between 120 to 140 days. Reimbursable icebreaker service costs are separated into fixed and operating costs, each are budgeted differently within the Department of Defense. Fixed costs for DOD are budgeted by the Navy, and operating costs by the actual DOD user.

An interagency study group was established to develop an analysis of polar icebreaking requirements for the balance of the century as referred to by the Commandant of the Coast Guard. We expect this study to be completed probably this spring.

The Navy has identified its long-term requirements based on peacetime and wartime needs, and has concluded that these requirements can be met by a four-ship icebreaker fleet.

That summarizes my statement, Senator.

Senator STEVENS. Thank you very much.

On the last item, you are talking about the military needs of the country. You are not addressing the total Government and commercial needs, those are just the Navy's needs, is that right?

Commodore SEESHOLTZ. In wartime, we see a potential need for a four-vessel fleet. In peacetime, we could do with less. Our share of a fleet of four would probably be covered if the Coast Guard met their operating standards of 185 operating days a year.

Senator STEVENS. You contribute, as the Department of Defense, to the operation of these icebreakers, do you not?

Commodore SEESHOLTZ. Yes; we do contribute to the costs. The DOD share of fixed costs the Navy bears, that is, the fixed costs of the ships, crews, etc. The actual deployment costs that are associated with the ship going to an area are reimbursed by the actual user. The money actually goes to the Coast Guard.

[The following information was subsequently received for the record:]

Fixed costs are prorated among routine users, based on the amount of their use during a year. A variation from year to year in use by agencies or the dropping out of a user presents a budgeting problem. If another major user reduces its operations to save funds, the cost to others rises proportionally. These last minute changes are difficult to plan and budget for. Having a single agency, the Coast Guard, fund the fixed costs would alleviate this problem.

Senator STEVENS. What part do you contribute to the construction of new vessels?

Commodore SEESHOLTZ. We contribute nothing to the cost of construction for vessels for these particular icebreakers.

Senator STEVENS. You do have something to say about the design of the new icebreaker, don't you? If we were to design new ones, they would be designed partly to meet national security needs.

Commodore SEESHOLTZ. That impact upon the ship, we view as probably relatively minor. We don't outfit them as full warships.

Senator STEVENS. I understand, but in terms of the *Polar* class, you had a say in the design of those vessels, didn't you?

Commodore SEESHOLTZ. Yes; we had some input. I was not here at the time. I will check and give you a statement for the record on that, to verify that.

[The following information was subsequently received for the record:]

Navy had no input to the design characteristics of the *Polar* class icebreakers and contributed no funds for their construction. There is no provision, in the class design, for the addition of modern weapons systems for wartime use. The total armament of the *Polar* class icebreakers consists of four 50 cal. machine guns.

Senator STEVENS. It seems that my other committee, the Defense Appropriations Subcommittee, is criticized from time to time because we have added money to the defense bill to have the DOD meet some of the costs of the Coast Guard associated with defense. From an operational point of view, there doesn't seem to be any problem. From the point of view of construction, there seems to be a great theoretical problem somewhere.

This is a comment, rather than a question, Commodore, because I think I know where it is coming from. I don't see any OMB witnesses on this first list, but we will have them here before we are through, I think.

Do you view the current fleet as capable to meet the military needs of this country in view of its age and construction?

Commodore SEESHOLTZ. Currently, the fleet can meet the requirements, but it is aging fast, and it is likely that the two older ships—40 years old, we usually find that that is about the limit of how long you can push a ship.

Senator STEVENS. Do you have vessels in your division? Under the National Oceanography Division, are there vessels assigned to you?

Commodore SEESHOLTZ. Yes; there are. They are really assigned to MSC, but we have technical responsibility for seeing to the mission of the ships.

Senator STEVENS. Your vessels aren't in much different condition, are they, aren't they aging, too?

Commodore SEESHOLTZ. Yes; they are.

Senator STEVENS. What is the average age of your vessels, do you know?

Commodore SEESHOLTZ. Ours are much younger, it is 18 years. I will get a statement for the record:

[The following information was subsequently received for the record:]

The Naval Oceanography Division research ships average 17.9 years old. I have two ships, the *Bowditch* and *Dutton*, that are nearly 40 years old. They are at the end of their useful life, and require near term replacement.

Senator STEVENS. 18 years?

Commodore SEESHOLTZ. About 18 years old, and they result mainly from the large oceanographic fleet building program of the 1960's and early 1970's, but mainly the 1960's. We have not built many oceanographic ships in recent years.

Senator STEVENS. No, as a matter of fact, there has been a propensity for laying those up, too.

What capability do we have in the Antarctic in terms of icebreaking now?

Commodore SEESHOLTZ. The Coast Guard provides the icebreaking service to the National Science Foundation, and the Navy is usually not directly involved in it. The Navy does not provide that service, that is provided by the Coast Guard.

Senator STEVENS. Are you related to that operation down there at all? Is that under your jurisdiction at the moment?

Commodore SEESHOLTZ. Only in a supporting sense. There is a Navy support force in Antarctica that provides the aircraft, and personnel to the National Science Foundation to give the logistic support necessary to operate the U.S. Antarctic program. As far as the icebreaking support is concerned, I do not have the responsibility for that, though the ships are under Navy operational control during Antarctic operations.

[The following information was supplied by Dr. Edward Todd, of NSF, for the record:]

There have been no occasions in the Antarctic that have involved a Soviet ship coming to the aid of a U.S. Government ship or station in distress. In checking our files and memory we recall one instance where a USSR salvage tug that was stationed in the Drake Passage area was engaged to assist the *M/V Lindblad Explorer* that had been accidentally grounded in the Gerlache Straits area on the west side of the Antarctic Peninsula. The *Lindblad Explorer* is a commercial tourist ship of Swedish registry, chartered and operated by a U.S. company.

There is a notable example of the employment of a Soviet ship to support a joint scientific expedition. During October and November 1981 the Soviet ship *Mikhail Somov* of the Arctic and Antarctic Research Institute of Leningrad was used by the Weddell Polynya Expedition, a joint U.S.-USSR interdisciplinary study in the sea ice area of the Weddell Sea. The *Somov* is a 440 ft. icebreaking antarctic research and supply ship. The expedition was able to penetrate more than 300 miles into the ice pack in the late winter to obtain a unique data set for the study of bilogical as well

as oceanographic, atmospheric and sea ice features of this important area. The scientific party included 13 members from each country. The U.S. component was led by Dr. Arnold L. Gordon of the Lamont-Doherty Geological Observatory of Columbia University and included scientists from five other U.S. institutions. The Americans provided much of the specialized scientific equipment. Although a USCG icebreaker would have been able to work in the sea ice of the Weddell Sea, none of them have accommodations and laboratory space for as many as 26 scientists.

Senator STEVENS. You have not been involved in any operations where you had to rely upon foreign icebreakers to conduct U.S. operations down there?

Commodore SEESHOLTZ. Not to my knowledge, but I will check on that and give you a statement.

[The following information was subsequently received for the record:]

The U.S. has not had to call on any foreign icebreakers to conduct U.S. operations in Antarctica. A joint US/USSR research experiment in the Weddell Sea in 1981 used a Soviet icebreaking supply vessel for the research as part of the Soviet contribution to the experiment.

Senator STEVENS. I heard that it was the case, and I would like to know if it was the case.

Commodore SEESHOLTZ. I will check on that.

Senator STEVENS. We thank you very much, Commodore. How long have you been in this office?

Commodore SEESHOLTZ. Almost 6 months.

Senator STEVENS. Where did you come from before you came to this one?

Commodore SEESHOLTZ. I had been over as Director of Command and Control Development within the Research and Development Directorate of the Office of the Chief of Naval Operations.

Senator STEVENS. We look forward to working with you, Commodore. Thank you very much.

Commodore SEESHOLTZ. Thank you, Senator.

[The statement follows:]

STATEMENT OF COMMODORE JOHN R. SEESHOLTZ, OCEANOGRAPHER OF THE NAVY

Mr. Chairman and distinguished members of the subcommittee, I am pleased to be here this morning to share with you the Department of the Navy's views on the United States Coast Guard polar icebreaking operations. At the outset I want to emphasize that Navy's association with the Coast Guard continues to be outstanding. My testimony will underscore the importance of the Coast Guard's icebreaking operations. The President recently defined the United States national polar interest and emphasized the growing importance of the polar regions to the nation in his memorandum of U.S. Antarctic policy and programs on 5 February 1982. Similarly, as recent as April 1983, he recognized the Arctic's importance to national security, resource and energy development, and environmental protection. The Coast Guard has maintained the United States sole polar surface maritime capability since 1965 when Navy transferred its icebreakers to the Coast Guard.

The Navy acts as the Executive Agent on icebreaker services for the Department of Defense (DOD) and coordinates all support requirements. Icebreaker escort services are required for the annual resupply of Greenland Air Force bases by Military Sealift Command ships. Navy requirements are primarily associated with classified research and fleet exercise support. The Army Cold Regions Research and Engineering Laboratory requires occasional icebreaker services in support of research and development efforts. On the average, annual DOD icebreaker support requirements range between 120 to 140 days.

Various methods have been used to finance the icebreaker fleet. Prior to fiscal year 1977 the Coast Guard funded all costs. Effective fiscal year 1977, the Coast Guard was directed to bill primary users for the incremental costs of operating in the polar regions. DOD was identified as a primary user and Navy received a budget

base transfer of $1.8 million. In 1982 OMB directed that primary users share the full direct cost of icebreaker services. Level funding of $8 million was provided, starting in fiscal year 1983, to cover all Department of Defense use of Coast Guard icebreakers. The basis for reimbursement for icebreaker use consists of a fixed cost and a deployment operating cost. The fixed cost covers personnel, fuel, operating and maintenance costs necessary to sustain the ships in basic operating status. It is payable regardless of vessel usage. DOD's fixed cost share for fiscal year 1983 was $9,060,000 and is estimated at $9,515,000 for fiscal year 1984. Deployment operating costs consist of actual fuel used in the polar operating area. These costs are billed to the actual user. Since fleet usage is shared, a Polar Icebreaker Users Council, composed of representatives from the primary user agencies, was established to resolve fleet management issues.

With regard to future polar icebreaker requirements, an interagency study group was established in mid-1983 to investigate requirements through the year 2000. Included in the study is an examination of force levels required in peacetime and wartime, funding for user services and funding alternatives for replacement ships during the 1990's. Although the study group will not report out until next month, Navy has identified its long-term requirements based on peacetime and wartime needs. We have concuded that these requirements can be met by a four-ship icebreaker fleet.

Mr. Chairman, I have briefly highlighted the Navy's views on U.S. Coast Guard Icebreaker Operations. I trust that I have been responsive to your desires in my remarks this morning. I am now prepared to address any questions you might have for me.

Senator STEVENS. Our next witness is Mr. Virgil Rinehart, the Acting Director of the Office of Advanced Ship Development and Technology for the Maritime Administration of the Department of Transportation.

STATEMENT OF VIRGIL W. RINEHART, ACTING DIRECTOR, OFFICE OF ADVANCED SHIP DEVELOPMENT AND TECHNOLOGY, MARITIME ADMINISTRATION, DEPARTMENT OF TRANSPORTATION

Mr. RINEHART. Mr. Chairman, my name is Virgil Rinehart, and I am the Acting Director of the Office of Advanced Ship Development and Technology of the Maritime Administration in the Department of Transportation.

I am pleased to appear before the Subcommittee on the Merchant Marine to comment upon the interest of the Maritime Administration in the polar seas, especially in the Arctic regions, the role of the Coast Guard icebreakers in pursuit of those interests, and related matters.

I have a short statement, and if it is agreeable, I would like to read it.

Senator STEVENS. Please proceed, Mr. Rinehart.

Mr. RINEHART. In July 1981, a representative of the Maritime Administration appeared before the Subcommittee on Merchant Marine and Fisheries of the House to testify on the development of Arctic marine transportation capability. He commented on the value to the Nation of the Prudhoe Bay oil field and other potential Arctic oil and gas fields, the inherent attractiveness of maritime transportation to supplement the single existing pipeline in order to bring those resources to market, and the potential benefits to the Nation that development of Arctic marine transportation systems might have, to quote him, "in terms of the objectives of the Merchant Marine Act of 1936, and in other contexts as well."

In the past nearly 3 years, there have been many developments, including the transfer of the Maritime Administration from the

Department of Commerce to the Department of Transportation. Neither this development or any others have changed the basic views of the Maritime Administration on these matters; indeed they have reinforced them.

Despite the recent dry hole at Mukluk Island in the Beaufort Sea, according to industry publications, North Slope operators still contend that the U.S. Beaufort Sea holds attractive prospects for the discovery of an elephant class field.

There are other strong exploratory efforts in the Bering and Chukchi Seas. In its report, "U.S. Artic Oil and Gas," issued in December 1981, the National Petroleum Council expressed its belief that large fields of oil and gas exist there. Further, we believe that year-round tanker operations in the Bering Sea are feasible, and perhaps north of the Bering Straits, although the reliability of these operations is not yet proven. We are aware of activities in this country and in other countries which reinforce our belief that within ten years, we will see Arctic tankers in operation year round in some of these areas.

Because of the importance of these issues to the Nation as a whole and to the maritime industries in particular, for nearly 15 years the Maritime Administration has studied the Arctic marine environment and the technical and economic feasibility of operating commercial vessels there on a year-round basis.

We have funded some 25 studies of Arctic-related subjects from the ice dynamics of the Arctic Ocean to the design of specific transportation systems. In addition, we have participated in the preparation of the National Petroleum Council report previously mentioned, in studies by the National Academy of Sciences, and in the activities of the Interagency Arctic Policy Group.

The report of this latter group to the National Security Council last year led to the issuance by the President of National Security Decision Directive No. 90, entitled "United States Arctic Policy." We believe that involvement by the Maritime Administration in these various activities has had a very important effect in bringing Arctic tanker operations as close to reality as they presently are.

Undoubtedly the most important activity has been the so-called "trafficability study," carried out over the past 5 years in cooperation with the Coast Guard, the State of Alaska, 12 companies of the Alaska Oil and Gas Association, and the Ministry of Transport-Canada. In 1 year, a U.S. shipyard participated, and last year the Interagency Ship Structure Committee funded some very important work to measure ice forces on the hull.

Each participant had its own reason for wanting to collect data. Our reason for cofunding this research was to measure ice conditions and ship performance at various times of the year over the various routes that a commercial ship might use. Our research was designed to examine such factors as ice thickness and coverage, ridge frequencies, and profiles, ship's power and speed, and fuel costs.

By collecting such data over a period of years, a better means of predicting the cost of delivering a unit of cargo, such as a barrel of oil, could be determined. Furthermore, confidence in potential year-round tanker operations was increased, and hence the possi-

bility that commercial companies would build and operate ships was improved.

The Coast Guard wanted to collect performance data on its current icebreakers in order to use them more efficiently, and to design even better ships in the future. The AOGA companies wanted ice data in order to evaluate the feasibility of exploration and development of various lease sites.

By this cooperative approach, each of the participants gained much more than it could have on its own and at less cost. We are extremely grateful for the use of the Coast Guard icebreakers, and I am certain that the other participants share this view.

We are aware that this subcommittee is very interested in the Nation's icebreaker requirements for the future. The Administration is equally interested in this issue. The number, type, method of acquisition, and operation of future U.S. Government icebreakers is now the subject of a comprehensive polar icebreaker requirements study mentioned by the Commandant of the Coast Guard earlier. Until that study is completed, I don't believe that it is appropriate for me to comment on the probable results, except to say that it seems clear that some icebreakers will be needed in support of national security and research purposes.

While future Arctic tankers will have the capability to transit heavy ice without icebreaker support, severe ice conditions and other unforeseen circumstances may require outside assistance. The experience of the Soviet vessels transiting the northern sea route this past winter indicates that even the most ice-capable ships operated by experienced ice seamen are not free from harm's way.

Such accidents are likely to occur from time to time; thus the need for icebreaker assistance to alleviate the risk of loss of life and property, and possible damage to the environment must be addressed. The capabilities of both the Canadian Government and private industry should be considered when this problem is addressed.

Finally, let me reiterate my belief that development of Arctic resources and routine operation of Arctic tankers in the Bering and Chukchi Seas will be accomplished in a relatively brief time. There is an opportunity for competitive U.S. maritime industries here. I believe that such participation is important to the Nation in order to assure that we will be able to transport our own oil to our own ports in our own ships, if that proves to be necessary.

In the United States, the funding, development and operation of these facilities almost certainly will be the responsibility of the private sector. Even so, as in the case of the Alyeska pipeline, there will be public issues, such as environmental matters, safety of life, development and enforcement of vessel standards, and other law enforcement, in which the Federal Government will play a significant role.

Mr. Chairman, thank you for providing the opportunity for the Maritime Administration to express its views on these important matters. I will be pleased to answer any questions that you have.

Senator STEVENS. What is your current funding for icebreaker research now, Mr. Rinehart?

Mr. RINEHART. From $100,000 to $200,000 in the present year.

Senator STEVENS. You don't have any at all for 1985 in your request?

Mr. RINEHART. We don't have any specifically designated. In our marine sciences program, below the line item level, we have earmarked about the same amount to continue this cooperative research with the other agencies that we have talked about.

Senator STEVENS. You had about $5 million in 1983, just a year ago?

Mr. RINEHART. That was a one-time blip. It was there in lieu of the free service that we had gotten from the Coast Guard by using their icebreakers in previous years. That $5 million was transferred to the Coast Guard.

As the Commandant explained earlier, when we went to a full reimbursement system, the existing icebreaking budgets were combined and reallocated. Our part of that allocation was the $5.3 million, which was to be returned to the Coast Guard for the use of the icebreakers.

Senator STEVENS. You are not using the icebreakers anymore?

Mr. RINEHART. We are cheating, Senator. We are riding the icebreakers when they go up north on other missions, and we use them as vessels of opportunity.

Senator STEVENS. Who is supposed to pay for them to keep that opportunity for you?

Mr. RINEHART. At the present time, there are three contributing agencies, the National Science Foundation, the Department of Defense, and the Coast Guard, itself, has some. I suspect that we are using some of the Coast Guard operating days.

Senator STEVENS. I seem to read between the lines that you believe that the commercial sector of our economy will provide icebreaking capability for the future to meet all MarAd needs. Is that an incorrect interpretation?

Mr. RINEHART. Of course, MarAd doesn't have needs in the sense that we operate anything.

Senator STEVENS. But you are supposed to assure that the merchant marine of the country will be able to function, aren't you?

Mr. RINEHART. We are supposed to insure that there is a merchant marine able to satisfy the Nation's needs.

Senator STEVENS. Your budget hasn't reduced from the time that you had the $5.3 million in support of the icebreakers. You are just directing your research money to other objectives now, aren't you?

Mr. RINEHART. I am not sure I understood the question. I understood you to say that our budget had not been reduced.

Senator STEVENS. Your overall budget.

Mr. RINEHART. Our overall research budget was reduced. At the time the $5 million was added, it was added to an approximately $11.5 million research budget. The total budget as it came to Congress was $16.8 million. Congress, in an economy move, reduced that by about $1.5 million, leaving a total of about $15 million of which $5 million was the icebreaker money.

In fiscal year 1984, the total budget was either $10 or $11 million, so it was reduced by about $5 million. So that $5 million was only in there for 1 year, and then we reverted to the previous level.

Senator STEVENS. My memory is that when MarAd was at Commerce, it was a little bit more interested in icebreaking capability,

and I am trying to figure out what has happened in recent years that has decreased the interest of Marad in the icebreaking capabilities of the Government.

Mr. RINEHART. As a matter of fact, I would say that the interest has increased. The level of funding was never large. I totaled it up over a period of about 10 years, we spent $3 million, or an average of about $300,000 a year. We are probably spending not quite that much now, but on the other hand, the leverage that we have had in this cooperative program that I have talked about, which brings in private money, State money, and other agency money, allows us to mount a significant effort, which we have been doing for the last 5 years.

The funding doesn't show it, but the effort has been even more substantial than it was in the past.

Senator STEVENS. What were the results of that trafficability study that you conducted in the Arctic?

Mr. RINEHART. That is a continuing program, and we still are doing it as a matter of opportunity. One of the results is that we now know better than we have ever known before what the ice conditions are over those routes that tankers are likely to take. We have found out that there isn't much ice that is level. It is mainly rubble and ridges. We have gotten out on the ice and drilled holes in it to actually measure the profiles of those ridges. Second, we have a lot of information on ship forces, resistance, speed through the ice, and the amount of fuel used. We have gained a great deal of information that is essential to deciding whether to operate tankers up there, or any other ships, because we now know how much it will cost to move a barrel of oil.

The third thing that we have done is to demonstrate that you can operate ships in the Arctic in the winter—not without difficulty, and we haven't said that there won't be problems in the future, but I think we have transcended the psychological barrier. Partly as a result of our trafficability studies, people are now going to design and operate ships up there. When I say, "our," I am including the Coast Guard, and the other participants.

Senator STEVENS. Thank you very much. We appreciate your help, Mr. Rinehart.

Our next witness is Dr. Edward Todd, Director of the polar programs at the National Science Foundation.

Proceed as you would like to. I do have your statement and your summary, and it will printed in full in the record in any event.

STATEMENT OF DR. EDWARD P. TODD, DIRECTOR, DIVISION OF POLAR PROGRAMS, NATIONAL SCIENCE FOUNDATION

Dr. TODD. Good morning, Mr. Chairman.

If the chairman concurs, I would just like to read a brief summary of my statement, and deposit the full statement for the record.

Senator STEVENS. Thank you.

Dr. TODD. The National Science Foundation is one of the Federal Government agencies for supporting research with longer range goals, that is, mostly basic research. In the polar regions, the research that we support is principally focused on trying to develop a comprehensive understanding of the nature and the global func-

tioning of components of natural environmental systems. The resulting research activities also contribute strongly to the maintenance of a cadre of expert scientists who are familiar with working in the polar regions.

The Foundation's interest in the two polar regions, the Arctic and the Antarctic, are different in several important respects. Arctic research by a large number of skilled and experienced polar scientists is being sponsored by a dozen or more Federal agencies or regional interests or private interests. Antarctic research, with minor exceptions, is conducted almost exclusively by the National Science Foundation.

Arctic research is facilitated by relatively easy access to the infrastructure of modern civilization—cities, airlines, universities, and so forth. Antarctic research requires the supporting agency to take on the responsibility for the acquisition and full-time maintenance of a dedicated operational logistics support system over 8,000 miles away from home, and over 2,000 miles from the nearest civilization.

A large part of the Arctic is an ocean covered by nearly inpenetrable ice, with occasional navigable waters adjacent to the coast. The Antarctic is a massive continent, 5.1 million square miles buried under miles-thick glacial ice, and ringed by a seasonally variable band of relatively thin 1-year sea ice that is penetrable by our polar icebreakers.

The Foundation has rarely used icebreakers in support of its Arctic research, and then only as a ship of opportunity. Quite by contrast, icebreakers are absolutely essential to our maintaining the active and influential presence in Antarctica that is dictated by national policy.

The icebreakers serve several distinct roles in the Antarctic program. First, there is the traditional channel clearing role for the annual resupply of our main station at McMurdo. The second use is the routine standby and escort duty for the cargo resupply ships to use that channel. The third use is, of course, the direct support of oceanographic or other research during the time when the ship is not needed for channel clearing.

A fourth and somewhat secondary role includes small scale transport and resupply of our smaller Palmer station on the Antarctic Peninsula. The research vessel role traditionally accounts for about 75 percent of the icebreaker operational days in the Antarctic.

In some years, the Foundation has been the largest user of U.S. icebreakers, however, we do feel that the ships are not quite optimized for our Antarctic mission and, as a consequence, may cost us a bit more than would be the case if they were optimized.

That summarizes my statement, Mr. Chairman. I would be pleased to respond to any questions.

Senator STEVENS. I understand that last comment, and it is probably very true. You have never thought of operating a class of icebreakers that were built solely for your needs, have you?

Dr. TODD. That would be one of my ambitions as the program operator, Mr. Chairman, I would very much like to see an icebreaker built that was optimized for the Antarctic mission that I have just described.

Senator STEVENS. You need just one, or how many would you need?

Dr. TODD. That is a fairly complex question. We are engaging in discussions with the Coast Guard now on the question of what kind of backup does an icebreaker need to insure safe and timely operation. This revolves around the question of, do you need as a minimum two icebreakers deployed, or can you work with one capable icebreaker, with the reserve icebreaker perhaps at a U.S. port. This gets into complex questions of seasonal timing, and so forth. So it is somewhat unresolved at the moment.

My own personal enthusiasm would be for more than one, but as a minimum I would like to see one icebreaker optimized for the Antarctic mission. It would normally operate with one of the other icebreakers in some sort of reserve capability. Whether it would be actually deployed to the Antarctic, or perhaps held in reserve in a U.S. port ready to go in case of emergency is not yet resolved.

Senator STEVENS. It would seem that if you had one that was designed to meet your needs, and there was an emergency, you might have, in an emergency, the ability to use one that wasn't totally designed to meet your needs.

Dr. TODD. That is correct, sir. The backup icebreaker would not necessarily have to be optimized for our mix of uses, but rather for normal icebreaker ship tending use.

Senator STEVENS. Were you involved in the operation of these icebreakers before we changed the funding mechanisms for their support?

Dr. TODD. Yes. The National Science Foundation, in the conduct of the Antarctic program, has been using the icebreakers for over a quarter of century, first when they were with the Navy, and more recently with the Coast Guard.

Before the change in the funding arrangement, we paid a fraction of the variable costs. The icebreakers were to us a real bargain, because we essentially paid only the fuel oil costs. The last year before the change, our costs were on the order of $1.8 million.

Then when the budget base transfer was made, and we began to pay our full proportion of the share of the cost of the icebreaker fleet, we got a budget base transfer of $13 million to add to that. In the current year, our funds programed for the icebreakers are $15.3 million of which about $14 million are our share of the fixed costs of the fleet.

Senator STEVENS. Thank you very much. I think I understand better what your relationships are to that. We will see what we might be able to do to put some accentuation on the design of an Antarctic capability as we go into a new class, if we are capable of doing that.

Thank you very much, Dr. Todd.

Dr. TODD. Thank you, Mr. Chairman.

[The statement follows:]

STATEMENT OF DR. EDWARD P. TODD, DIRECTOR, DIVISION OF POLAR PROGRAMS, NATIONAL SCIENCE FOUNDATION

Good Morning, Mr. Chairman, it is a please to have an opportunity to appear on behalf of the National Science Foundation (NSF) to testify on NSF's use of United States Coast Guard icebreakers. We use them, primarily in the Antarctic, to support

Foundation programs in two ways. The first is the traditional mode in which icebreakers are used to break a channel through the sea ice of McMurdo Sound and to excort resupply vessels to our main research and logistic support station at McMurdo in Antarctica. In recent years the newer *Polar* Class icebreakers, while enroute to and from McMurdo, have also performed the major annual resupply of our small Palmer Station on the Antarctic Peninsula. The other use that we make of the icebreakers is in direct support of research activities at sea, in the pack ice, or along the coasts of Antarctica. Both ways of using these ships are either directly or indirectly in support of the U.S. research program in Antarctica.

The committee will hear from the other witnesses of the direct importance of icebreaking activities to the development, extraction, and transportation of resources, such as petroleum, from the Alaskan and North Canadian Coasts. Such operations require a great deal of research, both basic and applied, and much of the research is performed by the private sector. The Foundation traditionally supports research with longer range goals, i.e., basic research. In the polar regions the research we support is focused primarily on developing a comprehensive understanding of the nature and the functioning of components of natural environmental systems. Thus, we regularly support projects in such disciplines as glaciology, meteorology, upper atmospheric physics, geology and geophysics, oceanography, polar marine biology, etc. We are trying to develop a comprehensive understanding of the global functioning of natural environmental systems; particularly the oceans, the atmosphere, and the polar ice sheets. There is also a strong need to have a level of research activity sufficient to maintain a group of skilled and experienced polar scientists in each of the relevant scientific disciplines.

The sense of urgency results from the realization that our current understanding of natural systems is incomplete and inadequate for the formulation of accurate predictions about their behavior. At the same time our knowledge of these systems is sufficient to cause legitimate concern that in a number of instances key phenomena exist in natural systems that may be susceptible to alteration as a result of the cumulative impact of human activities. We are also urgently concerned with understanding the natural evolution of global environmental systems and, we hope, to improve our ability to predict the impact of mankind.

In developing the necessary long-range understanding, a great deal of attention must be focused on the polar regions since they function as the major heat sinks for the circulation oceans and atmosphere and are a major controlling factor on sea level and ocean salinity through their storage of fresh water in the form of snow and ice. The two polar regions are, however, quite different. This can be illustrated by pointing out that the Arctic Ocean is surrounded by land and covered most of the time by a layer of ice.

The Antarctic on the other hand is a major continent, comprising some 10 percent of the Earth's surface, covered with a high cloud dome of ice and surrounded by open, stormy seas. The energy exchange between the atmosphere and the ocean in the two polar regions is quite different and thus their influence on global climate is also different.

The role of the National Science Foundation in supporting research is also distinct in the two polar regions. The Foundation supports approximately 15 percent of the federally-supported Arctic research. The work is done almost exclusively by university grantees, often in collaboration with scientists of other nations. NSF supported research in the Arctic is concentrated on the more fundamental end of the scientific spectrum and we have rarely used icebreakers in support of our Arctic research. In the case of the Antarctic, the situation is quite different.

Through the U.S. Antarctic research program, the Foundation has been coordinating and supporting our Nation's Antarctic research for nearly a quarter of a century. In the past decade or so a number of the executive decisions and congressional actions have served to concentrate the total budgeting, planning, and management responsibilities for U.S. activities in the Antartic, including the operational and logistic support, in the NSF. We depend haavily on the expertise of university scientists and scientists of other federal agencies, such as the U.S. Geological Survey and NOAA, to cite two prominent participants in our program. The Navy, as a result both of expertise and of traditional involvement dating back more than a century, provides a major portion of our operational support, especially flight operations, supply, and the resupply ships. Vital to the ship operations is the annual deployment of United States Coast Guard (USCG) icebreakers. Icebreakers are extremely important to us and, besides the traditional icebreaking and ship tending work they do, we have accomplished a great deal of important research with them.

Earlier in my testimony I have stressed the long-range importance of polar research to the welfare of mankind. Much of the research cannot be done unless the

scientific teams can be positioned deep in the ice pack. For example, this past season we used the coast guard cutter, *Westwind,* almost exclusively for research support in areas near the Antarctic peninsula. An important part of that deployment was an experiment in which scientists on board the *Westwind* worked deep within the ice pack in conjunction with other scientists on the R/V *Melville* of the Scripps Institution of Oceanography that was positioned outside the pack ice. Their work may give us a better understanding of the circumantarctic ice pack and its role in the annual cycles of the Antarctic ecosystem.

In general, it makes good sense from a managerial point of view to require each Federal activity to support its fair share of the costs of facilities and operational capabilities that it uses. At the present time the Foundation reimburses the U.S. Coast Guard for a share of the total fixed costs of the U.S. icebreaker fleet and for our appropriate share of the operational cost. On an annual basis both costs depend upon the number of icebreaker days devoted to NSF-supported programs. In 1984 these costs are estimated at $15 million. From a purely fiscal management point of view, the system works reasonably well and may ultimately help the Government in determining the desirable future size of the fleet and its composition.

In some years the NSF has been the largest user of icebreakers. On the other hand, the configuration, crew sizes, and thus to a large measure, the costs of operation are determined by the Coast Guard's multimission philosophy. If the ships has been designed specifically for our use, crews and costs would probably be smaller while space and facilities for scientists might be better. Therfore, we feel that in the present circumstances the NSF may be paying a higher cost than necessary.

A multiagency study of the Nation's requirements for icebreakers and the pros and cons of alternative ways of meeting that need is expected to be completed in a few months. This is the first such comperhensive assessment in almost two decades and the information from this study is needed to plan for future icebreaker needs.

Mr. Chairman, it has been a pleasure to appear before you. I will respond to any questions you may have.

Senator STEVENS. We now have a panel of Capt. Stan Putzke from Crowley Maritime Corp., and Robert L. Wilbanks of Sohio Petroleum Co. We had another witness who was delayed because of an airplane connection who will not be here.

Good morning, gentlemen. I appreciate your willingness to appear and to give us your views on the icebreaking capability situation.

You have some film here, Captain.

STATEMENT OF CAPT. STAN PUTZKE, DIRECTOR, MARINE OPERATIONS, CROWLEY MARITIME CORP.

Captain PUTZKE. I have a 3½ minute silent film which reflects some of Crowley's icebreaking activities in the Alaskan Arctic over the past 10 years. I also have some photographs, and they should be in front of you.

Senator STEVENS. Yes; I have those. We would be happy to look at your film now, if you would like, before you start your statement.

Captain PUTZKE. It will take a couple of minutes to rig it up, so I could summarize my testimony at this time.

Senator STEVENS. Yes, sir.

Captain PUTZKE. I am Stan Putzke, the director of marine operations for Crowley Maritime Corp.

By way of background, during my 30 years in the U.S. Coast Guard service, I served as commanding officer of two *Wind* class icebreakers, operating both in the Arctic and the Antarctic. For the past 13 years, I have also participated in Crowley's annual sealift to the DEW line stations in the Arctic and to the North Slope oilfields.

It is significant, I think, that Crowley has, over the past 14 or 15 years, delivered over a million tons of cargo to the Arctic above the Bering Straits. I don't think that there is any other company that has delivered more freight up into the Arctic. So with that 25 years of background, Crowley as a U.S. operator feels that they are in the forefront in ice operations, and they would like to stay there.

In 1975, Crowley experienced a very difficult ice year. During that year there were some 500 yards of ice that had a tongue of ice in front of Point Barrow, and we called upon the Coast Guard to break ice.

They did, and Crowley was able to deliver the cargo to Prudhoe Bay, a very crucial cargo in that timeframe.

However, we noted that the Coast Guard icebreakers had too deep a draft to assist us in our normal tugbarge route inside of the 4-fathom curve. So by 1976, Crowley built their first icebreaking barge, which is shallow draft, pushed by conventional tugs, with a horsepower of something like 14,000 or 15,000 horsepower. Since 1976, the icebreaking barge has fulfilled all of our needs.

On the basis of the Alaskan off-shore oil and gas finds to date, Crowley believes it is premature to build additional, costly, self-propelled icebreakers, either private or public, until a valid need is established.

Coast Guard icebreakers, because of their excessive draft, as I indicated, are unable to assist the tugbarge fleet operated inside the 4-fathom curve; therefore Crowley has preliminary designs for a shallow draft icebreaker, class IV, which is something between the Coast Guard *Polar* class and the *Wind* class icebreakers. As soon as a valid need or a substantiated oil find is available, not only Crowley, but I suspect other companies, will proceed with building private sector icebreakers.

Coast Guard icebreakers, in our opinion, are rather underutilized with their 30 percent operating time, and 70 percent maintenance standby time. With so much maintenance standby time, it is difficult to comprehend their alleged reliability and maintenance problems. I grant you that some of them are quite old, but you must remember that they were re-engined within the past decade. The hulls are very thick, and the engines being new, but we still have difficulty in understanding this maintenance problem that they have, particularly in view of the large crew sizes that they have.

The private sector would welcome the opportunity to compete with the U.S. Coast Guard for icebreaking and escort missions to the Antarctic, or to Greenland, on the basis of cost and performance. If such an opportunity were available, it might encourage the private sector operators to invest in building icebreakers which would also aid the ailing U.S. shipyard industry.

Finally, we are unable to understand why unarmed, Coast Guard icebreakers of class 6 to 10 should cost the Government between $300 and $500 million each to construct, when the same class icebreakers can be constructed by the private sector at a cost ranging from $50 million to $100 million.

Similarly, the operating cost for the private sector would be substantially less because such an icebreaker can be constructed and operated more economically with the smaller crews. In fact, I have a recent study that was completed indicating that a class 10 ice-

breaker, of which there is none in the world today, but class 10 being able to operate in 10 feet of ice in a continuous mode, could be built in North America for about $105 million. But this is the private sector's computation, and not the Coast Guard.

Mr. Chairman, we thank you for this opportunity to present these views. There is more detail, of course, in the long statement I have submitted. I would be pleased to answer any questions and show you our very brief film at your pleasure.

[The statement follows:]

STATEMENT OF CAPT. STAN PUTZKE, DIRECTOR, MARINE OPERATIONS, CROWLEY MARITIME CORP.

Mr. Chairman and members of the subcommittee, thank you for this opportunity to appear before you today to discuss the polar icebreaking operations of the United States Coast Guard. I am Captain Stan Putzke, Director, Marine Operations for Crowley Maritime Corporation. My prior experience includes 30 years of service with the U.S. Coast Guard, with seventeen years of that service on seagoing assignments culminating in command of two *Wind* Class icebreakers working in the Arctic and Antarctic regions. Since 1970 and after retiring from the Coast Guard I have continued my interest in icebreaking activities and have observed or participated in several of Crowley's Sealifts to Prudhoe Bay and have written icebreaking procedures for Crowley Maritime Corporation.

Before discussing the issues of Coast Guard icebreaking, specifically in the Polar regions, I would like to provide background on Crowley's experiences with Arctic towing and icebreaking—operations our company has been conducting for twenty-four years. This discussion of our activities will provide you with an idea of the extensive experience and modern equipment available from the private sector. A Crowley adapted Arctic map is attached for your reference.

ALASKAN ARCTIC ACTIVITIES AND EQUIPMENT

Beginning in 1957 a Crowley company undertook government contracts to resupply the DEW Line stations along the Western Alaskan Arctic coast. This operation was so successful that since 1957 oil and cargo has been transported to the DEW Line stations, Air Force stations, and isolated Coast Guard and other military stations in Alaska by Crowley tugs towing barges. Such operations have required Crowley's tug barge fleet to round Point Barrow and transit ice covered waters to the Canadian border each year.

Following the discovery of petroleum under Alaska's "North Slope," Arctic Marine Freighters, a Crowley company, was tasked to transport waterborne cargoes necessary for North Slope oil field development. Since 1968 a yearly sealift has delivered a total of a million tons of cargo through the Alaskan Arctic ice in support of the petroleum exploration and development activity in that isolated area. One of the most significant years was 1975, during which one of the largest sealifts of oil field and pipeline supplies was undertaken to Prudhoe Bay. Because of unusually heavy ice, there was serious doubt as to whether the supplies could be delivered that year. At the last moment and late in the season, a 500 yard finger of ice prevented passage around Pt. Barrow. A *Wind* Class Coast Guard icebreaker was helpful in breaking that 500 yards of ice, but the vessel's deep draft curtailed further assistance in the shallower inshore waters adjacent to the delivery sites. In short, only tugs and barges can be used to deliver the cargo to shore sites.

To keep this operation in perspective, it is important to note that the combination of weather conditions and shallow water results in a period of only a few weeks during which the flotilla of tugs and barges can deliver their cargoes and depart with any backhaul cargoes before the waters again become impassable. The critical nature of this "window" has been illustrated by the icing in of a Russian flotilla of vessels last winter while attempting their own version of our sealift to supply Siberian and far norther communities. The Russians suffered vessel loss and substantial vessel damage.

As a result of the 1975 experience, Crowley Maritime Corporation designed, built and delivered to the Western Arctic, in time for the 1976 season, an innovative icebreaking barge. That barge and two subsequently constructed similar icebreaking barges each pushed by a pair of high horsepowerd tugs have fulfilled all icebreaking escort needs since the 1975 Prudhoe Bay Sealift.

Like the Coast Guard's *Wind* Class Polar icebreakers, the icebreaking barge is capable of breaking three feet thick first year ice when operating in a continuous mode and up to six feet thick ice in a ramming mode. Extra heavy steel together with additional framing is used to shape a special ice breaking bow with empty wing tanks on each side to protect the cargo in the holds and on deck. The shallow draft barge protects its two tugs used for propulsion by its exaggerated stern notches. Unlike the self-propelled icebreakers, the pushing tugs, crewed by eight men each, will return the barges when they are no longer needed—thus freeing the tugs and crews for other jobs. Construction costs were modest for these unmanned icebreaking barges, and when not in use as icebreakers or supply barges they are moored without personnel or operating costs.

Polar icebreakers, as opposed to domestic icebreakers used in the Great Lakes and Eastern rivers, require sturdy, powerfully built vessels. They also must have extended cruising range and the capability of wintering in the ice. The Coast Guard's five polar icebreakers are capable of such operations, the *Polar Sea* and *Polar Star* being the most able with their unusual propulsion sytems. Expansion of this fleet, including construction costs, operation costs and time to perfect the systems should be measured against the anticipated needs of those developing the oil and gas resources and the existing construction plans and operating efficiencies private industry has to offer.

COMMERCIAL NEEDS

As mentioned before, over the past twenty-four years Crowley has delivered more than a million tons of cargo, both liquid and dry, to Prudhoe Bay and the government stations well above the Arctic Circle. This tonnage is far in excess of any other Western Arctic operator. Since 1975, when Crowley built the first icebreaking barge, there has been no need to call upon the Coast Guard polar icebreakers. Our inshore route around the Alaskan Arctic is normally inside the four fathom curve, which prevents the Coast Guard icebreakers with their deep drafts from helping the tug and barge fleet in any event. Most important however is that the innovative and inexpensive icebreaking barge has proven wholly effective for our needs to date. In short, there was a need for icebreaking capability which the Coast Guard's vessels could not supply, so we have met that need ourselves.

Substantial effort and money has been invested in the search for offshore oil and gas in the Alaskan Arctic. Some offshore exploration has taken place and other offshore exploration efforts are expected to follow. Should hydrocarbons of production quantities be identified above the Bering Strait, icebreaking craft of various types will be needed. Much of that need will be in waters too shallow for the Coast Guard's icebreakers. At this stage, Crowley and several other operators have preliminary or completed designs for self-propelled icebreakers ranging from Class 2 to Class 6 and are awaiting the validation of such finds before translating designs into vessels. Had the Mukluk well proved a susbstantial find, there is every reason to expect that private sector icebreaker construction would now be underway. Until such a need is established, or until private sector operators can be assured of obtaining some of the federal icebreaker work now done by the Coast Guard for other agencies, common sense dictates that we await realistic evidence before starting new icebreaker construction.

ADEQUACY OF THE COAST GUARD'S FLEET

The Coast Guard's existing polar icebreaker fleet, according to the Coast Guard itself, has "marginal capabilities." Although we are unable to identify their future icebreaker missions, the record shows that the Coast Guard averaged a low 29.2 percent operating (underway) time in 1981 and spent 70.8 percent of their time in maintenance and standby. In 1980, they averaged 34.9 percent operational time, and 65.1 percent time in maintenance or standby. Even with the recent damage and impending layup of the *Westwind*, there is every indication that the remaining four polar icebreakers are underutilized. For instance, Crowley and most other offshore operators seek to achieve 75 percent underway time for their seagoing tug fleet, which includes 2-3 months in the Alaskan Arctic. The Coast Guard icebreakers, unlike Crowley's tugs, are specifically designed with greater strength, system redundancy, and long at-sea capability. Accordingly, we believe that until such time as their utilization doubles, they are capable of substantially more Arctic and Antarctic employment. Unless the Coast Guard foresees some lasting new mission requirements for their icebreaker fleet, unknown to ourselves, that would permit their vessels to approach the 75 percent underway time standard, then we believe they are not justified in planning for additional icebreakers.

ICEBREAKER CHARACTERISTICS

The design of U.S. military icebreakers is characterized by sturdy vessels with heavy scantlings and thick, high strength steel. The purpose of the hull is to accommodate powerful engines and carry huge quantities of fuel for their own use. They also carry large crews consisting of 150–200 personnel. Although they carry no weapons systems, they do carry two helicopters. They are unable to transport dry or bulk cargo in appreciable quantities to serve the isolated stations along their route. Owing to their deep draft, Coast Guard icebreakers are unable to transit the shallow inshore route which is essential to deliver the supplies needed at the DEW line station and Prudhoe Bay.

The icebreakers operated by the Canadian and European private sectors, as well as those planned for U.S. offshore operators, would have ice-breaking characteristics equivalent to the Coast Guard breakers, plus the ability to transport containerized, deck and bulk liquid cargo and/or helicopter decks. They will have the towing capability to tow barges loaded with cargo, and be operated efficiently by crews of 20 personnel. Such capabilities would eliminate the need for additional federal icebreakers, whose principal capability is that of busting through ice.

Should Crowley or any other operator construct self-propelled ice-breakers of Class 3 or above, they would have no less icebreaking capability than the *Wind* Class or Glacier. Such a private sector icebreaking vessel could also support the U.S. federal resupply efforts to Greenland and the Antarctic, but there must first be a stated request for such services. It matters not whether the vessel is operated by the Coast Guard or the private sector, as long as it can transit ice of a given thickness. In fact, larger European tug supply vessels, owned and operated by private sector interests, have delivered supplies, fuel and personnel to European and Australian Antarctic stations for many years. Since they are supply vessels as well as icebreakers, they are capable of carrying out a supply mission with small crews and without additional icebreaker support as is the common practice in the United States. Crowley icebreaking barges are in the same category, since they not only break the ice, but also carry fuel or supplies on deck in large quantities.

NO NEED FOR VESSEL REPLACEMENT

The forty year old *Westwind* and *Northwind* have undergone major repowering within the past decade at substantial cost. Owing to their heavy scantlings and heavy shell plate, they are extraordinarily sturdy hulls with comparatively new power plants. They are a well proven icebreaker, regardless of their chronological age. The price of replacement vessels of equivalent capability as designed by the Coast Guard would exceed by many times the cost of refit of the hulls of the *Westwind* and *Northwind*. Considering the sturdy, powerful nature of these vessels and the devotion to them of so much time for maintenance we find it difficult to comprehend the costly "reliability and maintenance problem" described by the Coast Guard. Although we can fully understand the agency's desire to have newer vessels, the question is really one of continued serviceability of the existing vessels which are as capable of transiting ice today as they were in the past. The ice is no heavier today than it was in the previous years.

Accordingly, it is our opinion that federal agencies first have a responsibility to fully employ their valuable, usable resources before seeking funds for replacements. One of the points often overlooked with icebreakers is that they spend less than 1 percent of their life cycle time in the ice. All of the remaining underway time spent enroute to or from ice infested areas is normal oean cruising requiring no icebreaking capability at all.

FUNDING ISSUES—NEW CONSTRUCTION

The present day costs for construction of icebreaking vessels is very high, with no indication that costs will decrease. Part of the high cost involves design, which may be minimized by using established designs. A Class 4, 6 or 10 icebreaker, whether designed and built by and for the U.S. Coast Guard or the private sector, will go through the same thickness of ice. Consequently, we are unable to understand why a Class 4 icebreaker costs the Coast Guard $300 million, and the private sector only $50 million. At least one U.S. designer estimates construction costs for a Class 10 icebreaker to be less than $100 million, whereas Coast Guard estimate is calling for five times that amount. With so many proven designs for icebreaking vessels throughout the world we question the wisdom of the Coast Guard's in-house design in the light of the years of difficulty with the *Polar Sea* Class vessels. We also question the need for excess manning on military vessels without weapon systems, when

the only purpose is to make passage through an icefield. We believe that a reasonable compromise is achievable between existing proven vessel designs and the high military manning levels. If such a compromise is not achievable, the tax payer is entitled to an explanation.

USER FEES

Crowley Maritime Corporation is on record as supporting all efforts to maximize the efficiency of federal services, and in the icebreaking context feel generally that the recovery of direct and indirect operating costs for Coast Guard icebreaking services should be assessed against the private and federal recipients. Exceptions exist where the beneficiaries may be established communities that, for example, may become imperiled due to ice blockage of a river subject to flooding its banks. In such a situation Coast Guard vessels should be pressed into service without charge, because the public interest is at stake. The same should be said regarding efforts of "keeping the channel open." Ice buildup in a riverine environment can sometimes be avoided by periodic passages through the waters to aid the flushing out process. While such a procedure is not applicable for ice in the Arctic basin, the Davis Straits to Greenland or the Antarctic, it is sometimes effective in the rivers.

For services rendered, whether between government agencies or private enterprise, it simply makes good business sense to assess the full value of the direct, indirect, amortization and insurance equivalent costs involved. Without such a procedure, values become distorted by token charges masking the uses of and accounting for the tax dollar. Lacking such an open and aboveboard system, there is no fair way of comparing government costs to the private sector's equivalent services.

In summary, Crowley supports a cost recovery policy for Coast Guard icebreakers. The policy would encourage private enterprise to construct and position ice-classed or icebreaking vessels where the need exists and where they can perform the same functions at a lower cost. Such a procedure would benefit all concerned and take advantage of the flexibility of the free enterprise system.

Crowley personnel have maintained a year-round presence along the Alaskan outposts at Prudhoe Bay and other remote ports for many years. Having lived with the ice and weather for those years they are knowledgeable and aware of what is operationally feasible. While it is not our intention to denigrate the experience or opinions of others, we know, for example, that some multiyear tabular ice floes are present in the Beaufort and Chukchi Seas through which no icebreaking vessel in the world today can force a passage. Given this condition even a Coast Guard icebreaker would be useless. For less extreme conditions, however, private sector icebreaking equipment could do the job at a lesser cost.

Crowley Maritime is considering construction of a Class 4 shallow draft icebreaking vessel. Common sense dictates we await evidence of a realistic need before initiating such action. Even though such an icebreaking vessel would also serve to support the U.S. Federal resupply efforts in Greenland and the Antarctic, there must first be some commitment to make use of such a vessel. As of today that commitment, whether by government contract or charter, has not come to pass.

We believe the United States Coast Guard serves many useful and needed functions and has a long undisputed history of service to the nation. Consequently, we do not wish to deny them the needed resources to carry out those vital functions. However, in the case of polar and domestic icebreaking, we urge the Subcommittee to consider the costs and effectiveness of all alternatives. The realistic cost recovery for services should be weighed against private sector charter rates for the same tasks.

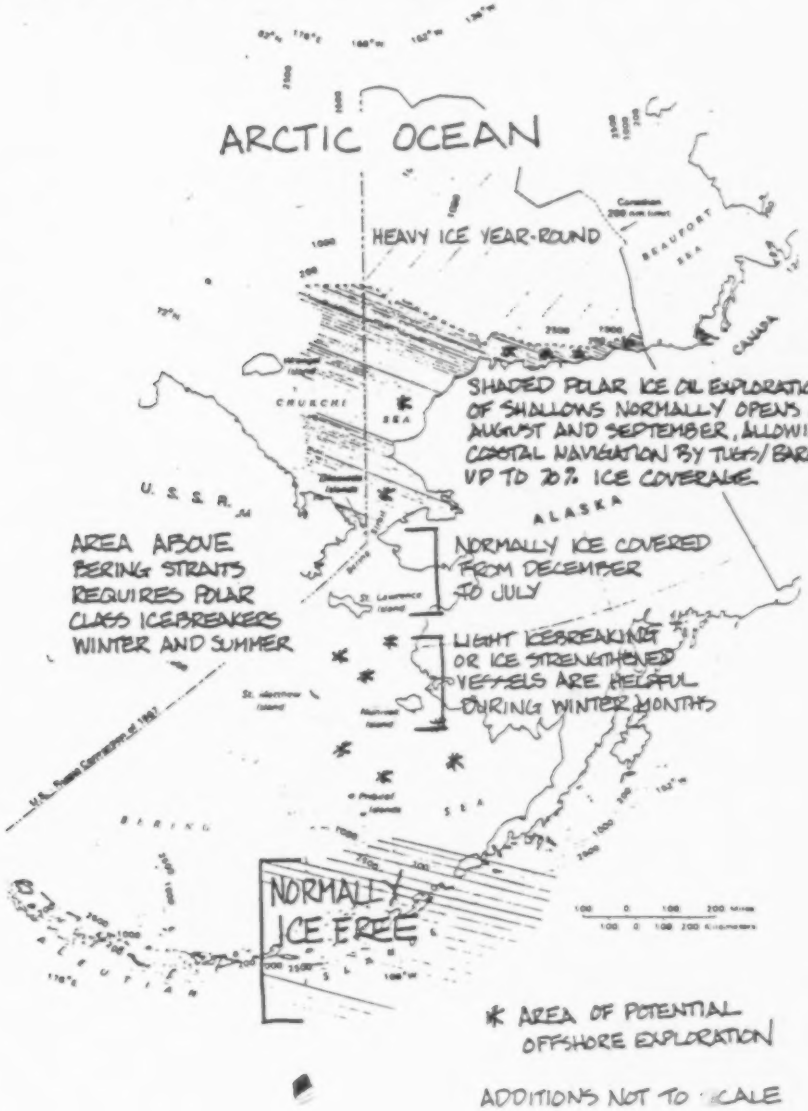
The record shows that existing Coast Guard icebreakers, regardless of age, are underemployed. In spite of that lack of use they remain fully manned in a repair status for the majority of the time. In view of the recently repowered Wind Class and the year-long maintenance now taking place on the GLACIER, we are unable to understand their alleged "costly reliability and maintenance problems" as stated by Coast Guard spokesmen. If the Coast Guard requires additional funds to keep the existing icebreakers operational, they should have these funds as the alternative is very costly new construction, which we believe are unwarranted at this time.

In view of the very high cost of icebreakers we recommend that serious evaluation be given to icebreakers that can also transport fuel and cargo. Traditional icebreaking vessels operated by the Coast Guard can do little more than force their own way through ice, then wait for the wind and current to blow the loose ice away. An alternative is to negotiate contracts with private sector transportation companies for delivery of supplies to Greenland and the Antarctic, thereby eliminating a portion

of the need for Coast Guard icebreaking support and encouraging a healthy building program for the private sector.

Crowley appreciates this opportunity to share our experiences with the Subcommittee Mr. Chairman. We remain ready to assist with further information as you may request.

POLAR ICEBREAKING REGION


ARCTIC OCEAN
HEAVY ICE YEAR-ROUND
BEAUFORT SEA
CANADA
SHADED POLAR ICE OIL EXPLORATION OF SHALLOWS NORMALLY OPENS IN AUGUST AND SEPTEMBER, ALLOWING COASTAL NAVIGATION BY TUGS/BARGES UP TO 70% ICE COVERAGE.
CHUKCHI SEA
U. S. S. R.
ALASKA
AREA ABOVE BERING STRAITS REQUIRES POLAR CLASS ICEBREAKERS WINTER AND SUMMER
NORMALLY ICE COVERED FROM DECEMBER TO JULY
LIGHT ICEBREAKING OR ICE STRENGTHENED VESSELS ARE HELPFUL DURING WINTER MONTHS
BERING SEA
NORMALLY ICE FREE
* AREA OF POTENTIAL OFFSHORE EXPLORATION
ADDITIONS NOT TO SCALE

Senator STEVENS. Why don't we hear from Mr. Wilbanks, and then we will turn this thing on. I have a few questions, too.

Mr. Wilbanks, very happy to have you here with us, also.

STATEMENT OF ROBERT L. WILBANKS, MANAGER, FRONTIER PROGRAMS, SOHIO PETROLEUM CO.

Mr. WILBANKS. Thank you very much, Mr. Chairman.

My name is Robert Wilbanks. I am manager of frontier programs for Sohio Petroleum Co., Western Region. My responsibilities essentially are for development of plans and conducting programs for the exploration and development of facilities to extract oil and gas from the frontier reaches, such as the Arctic Beaufort and Chukchi Seas.

I would like to provide Sohio Petroleum Co. assessment of needs for icebreakers, and icebreaker services in support of our operations at Beaufort.

Sohio speaks from its position as an industry leader in the Arctic and Alaskan oil and gas development activities. Our substantial operating experience in the region is matched by an equally aggressive corporate commitment to a very aggressive exploration and development program in Alaska in general.

Our purpose for making this statement is twofold. First, as a representative of the private sector, heavily invested in the future of oil and gas development in the Arctic, we want to ensure that you have an understanding of the realistic views of potential activities associated with these exploration and development activities in the future.

Second, as a corporate citizen, we feel strongly about the need for a prominent presence and reliable capability of the U.S. Coast Guard in Alaskan Arctic waters. That presence, we feel, is required to provide emergency rescue, escort services, the traditional types of services provided by the Coast Guard.

The oil and gas industry generally agrees that the Beaufort and Chukchi Seas overlay one of the world's most prospective areas for future oil and gas production potential. The very competitive bidding and large amounts of money spent in the September 1982 Federal lease sale OCS–71, we think reflects that feeling.

OCS–71, although it contained several prospective areas, actually only provided to the industry the opportunity to bid on about 15 percent of the general area of interest within the boundaries of the Outer Continental Slope. We expect that future lease sales will likely generate similar levels of interest.

Assuming that Federal and State lease sales are conducted as currently planned, we expect that the industry will continue its aggressive search for oil and gas. It isn't difficult then to believe that exploration drilling at several Beaufort Sea locations will likely be conducted during the period 1985 through 1990. With any success, significant activities associated with the development of those reserves is likely to be conducted through the 1990's.

Because of the rather severe environmental conditions in the Arctic, specialized drilling structures and transportation equipment are required to insure safe and reliable operations. Of all the envi-

ronmental factors that we face, ice is by far the primary environmental element with which we must deal.

Our equipment has to be designed to accommodate that in our operations. It must be tailored to meet the problems associated with ice. In much of the Beaufort Sea, industry has available a very brief open water season within which to conduct marine operations. The season typically ranges from about 12 weeks near shore to 3 weeks or less sometimes in areas 20 to 30 miles offshore.

Marine operations carried out during this period include the movement of major annual sealifts from the lower 48 States to the Beaufort area, the construction of gravel islands or drilling pads, the movement of mobile drill structures, data gathering, soil sampling, and supply and resupply activities associated with our operations. In the open-water season of 1983, 120 marine vessels, or slightly over 120, were employed by the oil and gas industry in the Alaskan Beaufort Sea in support of these types of operations.

Also during 1983, Sohio constructed Mukluk Island, a manmade gravel island in about 45 feet of water. The fleet required to construct that island during the brief summer season totaled 45 marine vessels; 1983 was an usually brief and severe summer, and we don't know that that is typical, and we don't think that future planning for construction should necessarily be predicated on that experience.

In future operations, we expect that the use of movable structures or drilling platforms will probably become common. The numbers of marine vessels required to support that activity will be somewhat lesser than for the construction of gravel islands, but we expect that it will be significant.

There are other areas with potential for substantial hydrocarbon deposits off of the western coast of Alaska also. Many of these are in areas not suitable for pipelining into the TAPS pipeline. It is anticipated that the oil will probably be removed by tankers. These areas are covered by ice at various times of the year, depending upon their location. We feel that they will require icebreaking support from time to time.

Beyond the oil and gas related activities, there are, of course, other marine activities in Arctic waters that should be considered. Through our membership in the Oil/Fisheries of Alaska, we are aware that fishermen and processors contribute substantially to the global picture of marine activities in the Beaufort Sea.

This global picture indicates that future levels of marine activities in the Arctic are expected to be such that the needs for emergency and rescue services justifies an extended presence and capability on the part of the U.S. Coast Guard.

As we confirmed in the construction of Mukluk Island, icebreakers are essential in that they provide the only means of extending our construction period and insuring safe and reliable transportation of people and material in ice covered waters. During the construction of Mukluk Island again, the oil companies that participated with Sohio in that operation, spent in excess of $4 million in charter lease costs for Canadian icebreakers.

Unfortunately, no U.S.-flag vessels were available to provide the icebreaker support that was required to get the job done safely and

timely. Today there is not a single, U.S.-built, self-propelled, ice class vessel operating in the Beaufort or Chukchi Seas.

Sohio believes that commercial marine operations to support offshore oil and gas activities should be provided by the private sector. We also believe that the private sector will respond to this need when an economically viable hydrocarbon reserve is discovering, signaling, of course, a major development effort.

Until that occurs, however, industry still has needs for icebreakers to provide support in the critical period of exploration activities preceding a discovery. This may be one or several years. The only current option available to us during this period is to continue the practice of leasing Canadian vessels.

We believe also that the Coast Guard must be equipped with a new generation of equipment and develop highly skilled ice pilots for that equipment in order for it to effectively and reliably conduct its traditional mission. Although the *Polar* class vessels currently operated by the Coast Guard are mission capable, the Coast Guard appears to be continually improving their reliability, the reliability of the *Polar* class vessels. The vessels are not fully suited for Beaufort Sea applications. They are primarily restricted to their deep draft which generally prohibits them from operating within the 15 to 20 miles from the coast.

Since 1980, Sohio, together with 11 other oil companies has participated with the U.S. Coast Guard in a multiyear program of operational assessment and environmental data gathering on board the *Polar* class vessels.

From this experience, we have observed that much valuable data has been collected, and much has been learned about the operation of the *Polar* class vessels. With the knowledge from operations with these vessels, the Coast Guard should be prepared to fully apply that knowledge in consort with available and very capable designers and shipbuilders, so set criteria for a new generation of icebreaking vessels.

These advanced, shallow draft vessels would not only provide improved capability and reliability in the Beaufort and Chukchi Seas, they could be more efficient, require smaller crews and cost less than the *Polar* class vessels.

In summary, we note with concern the limited presence and operational capability of the U.S. Coast Guard in Arctic waters. In addition to the best national interests, which we believe would be served by expansion of the service's capability in this strategic and highly potential region, we believe that such expansion would be in the best interest of our industry, other Alaskan industries, and the citizens of Alaska.

We believe it is time for decisive Federal action designed to insure the Coast Guard is properly equipped and specifically directed to begin routinely conducting operations in the Beaufort and Chukchi Seas within the next 3 to 4 years.

Senator STEVENS. I wish to God we could get it done in 3 to 4 years. I don't think that we can get it done that fast, Mr. Wilbanks, but I share your feelings.

Captain PUTZKE. I am sure that it is a function of the types of equipment that are required, that have to be designed and be built.

In our own program, we have done preliminary design of class 6 icebreakers, and based on our requirements, they can be delivered within a 3- to 4-year period, and possibly even earlier.

Senator STEVENS. Captain, do you want to show us that film, and then I have a couple of questions here.

Captain PUTZKE. Yes, sir, Mr. Chairman. This film is extracted from a sound film. It is really just footage of Crowley activities in the ice. Each year, of course, we start out from Seattle with our sealift and go the 2,700 miles to Prudhoe Bay, and then normally wait for the ice to open.

I might add that in the arctic, particularly in the Beaufort and Chukchi seas, it is very unpredictable from year to yea. I know that they have had a lot of statistics, but it is difficult to tell how heavy the ice is going to be. Then certain conditions of wind and current have to open that inshore sector route so that the tugs and barges can get through in less than 20 feet of water, which doesn't always happen.

The icebreaking barge, for our use to date, has been adequate.

Senator STEVENS. How long does it take to make that trip annually?

[Film being shown]

Captain PUTZKE. It takes us about 2½–3½ months from start to finish. That was (referring to film) 1975, very late in the season when the freeze caught us and we really had a pretty difficult time.

As a matter of interest, those tugs operating are non-ice-breaking tugs. They are conventional tugs, and they have to go very slow because they are also towing essentially conventional barges; they are not icebreaking barges.

You will see in a couple of seconds the icebreaking barge that has changed our operating mode. This again is 1975. There is the icebreaking barge delivered in 1976, 105 feet wide, a shallow draft, quite a lot of horsepower, and it is ideal for ice coverage up to 70 percent. It can break as much ice as the *Wind* class icebreaker in a continuous mode.

We really don't like to operate in a backing and ramming mode because that is not what that barge was designed for. Unlike a self-propelled icebreaker per se, which can do nothing but travel through ice, we can also carry petroleum products in the center tanks. We can also carry deck cargo on the deck. It is quite a useful thing. When we finish, we tie it up, and there is no expenditure.

I spoke of multiyear ice, this is typical (referring to film) of multiyear ice, with the melt pools, and that stuff is very hard. It is a great deal different from first-year ice.

There is the icebreaking barge with only one pushing tug.

I think that it is about the end of it.

Senator STEVENS. Captain, you take the position that the commercial sector ought to be able to provide what is needed by the industry in the arctic, is that right?

Captain PUTZKE. For routine operations, yes, sir.

Senator STEVENS. You do concede, as does Mr. Wilbanks, of the necessity for the normal Coast Guard kinds of functions in the Arctic as the traffic increases?

Captain PUTZKE. There is no question about it. I think that the Coast Guard has a role.

Senator STEVENS. In order to fulfill that role, they will do more icebreaking as we start more and more year-round operations.

Captain PUTZKE. They will indeed.

Senator STEVENS. With 70 percent of the Outer Continental Shelf off the coast of Alaska, that is where the action is going to be for the next 20 years. Is the Navron going to be involved?

Mr. WILBANKS. The upper reaches of the Navron may require icebreaking support from time to time.

Senator STEVENS. The Northern Sound, the Barrow Arch, the Beaufort, all will require icebreaking capability of increasing intensity if there is a significant discovery there.

Mr. WILBANKS. That is correct. The discovery itself is our primary concern at the moment. The immediate objective at hand is to acquire the leases and conduct the exploration activities, activities that will from time to time be jeopardized by ice, as we found last year. Sohio believes that the private sector is going to provide self-propelled icebreaking capability at some point in time, but our concern is will it be fast enough to provide the service that we need during the exploratory phase.

Senator STEVENS. Is your company the one that used the Soviet icebreaking capability.

Mr. WILBANKS. Not to my knowledge.

Senator STEVENS. There was one incident that I remember reading about in the Arctic, and one in the Antarctic. I am going to have to get the documentation on that.

You really foresee, both of you, the need for the shallow draft icebreaking capability as far as the Arctic is concerned as being the predominant need, is that right?

Mr. WILBANKS. There is no doubt, at least for the next 5 to 10 years, because that is the area in which leases have been offered, and in which exploration activities are most likely to occur first. For that reason, within the Continental Slope, which is located about 40 miles offshore, shallow draft icebreakers will be much more functional. That is our assessment.

Senator STEVENS. Very good. I do thank you for your time and your assistance.

Thank you very much, gentlemen.

[Whereupon, at 11:44 a.m., the subcommittee recessed.]

ADDITIONAL ARTICLES, LETTERS, AND STATEMENTS

STATEMENT OF WILLIAM C. O'MALLEY, PRESIDENT, SONAT OFFSHORE DRILLING, INC.

Mr. Chairman and members of the Merchant Marine Subcommittee, my name is William C. O'Malley. I am President of Sonat Offshore Drilling, Inc. and Chairman of the Government Affairs Committee and a Director of the International Association of Drilling Contractors (IADC). I am appearing today on behalf of the IADC, the National Ocean Industries Association (NOIA), and the American Petroleum Institute (API).

I plan to briefly discuss the importance of Arctic exploratory efforts, our involvement and commitment as both a company and an industry, the import of the program to the national interest, and to endorse a continuing strong supporting role of the United States Coast Guard.

In spite of recent reductions in the price of oil and what appears to be a temporary situation of worldwide capacity in excess of current demand, our industry is very concerned about our ability to replace existing reserves at a satisfactory pace. Our nation shares this concern but more particularly within the boundaries of U.S. international waters. Most estimates indicate that major undiscovered reserves lie in remote areas of the world in deep waters or in harsh environments including Offshore Alaska as well as the Arctic.

Frontier areas such as Alaska and the Arctic present many unusual and forbidding challenge—expansive ice regions, ice infested waters, and the penetrating cold of long winter months. Companies within the oil industry are required to make forward strategic decisions involving huge capital spending programs to seek major new finds in these frontier area. From the leasing of tracts through seismic work, exploratory drilling, producing and gathering systems, these programs are huge—each is of several years duration if commercial quantities are uncovered.

My company, Sonat Offshore Drilling, Inc. is involved heavily in the frontier markets of deep water and harsh environment drilling. Sonat is the owner of the Discoverer Seven Seas now drilling for Shell Oil Company in the Wilmington Canyon off the U.S. East Coast. The Discoverer Seven Seas is a very large and sophisticated drillship which has several times in different areas of the world broken records for deep water drilling. Our ship recently set a new record drilling in 6,800 feet of water. Sonat now has under construction a multi-purpose semisubmersible rig, the Henry C. Goodrich, which will be capable of drilling in 10,000 feet of water. Sonat is also currently involved jointly with a Norwegian Company, W. Wilhelmsen, in the design and construciton of a new generation semisubmersible rig which will be capable of working well above the Arctic Circle on a year-round basis in areas where drilling is now curtailed to a short summer season. This rig, like the Henry C. Goodrich, will approach 100 million dollars in cost. This reveals much about where we think the oil industry is headed. We have committed a large part of our future to frontier markets. We expect the busiest offshore frontier areas will be within the northern latitudes of the North Sea, the Canadian East Coast and Alaska Offshore, particularly within the U.S. and Canadian Beaufort Sea and the Bering Sea.

Other companies, including Rowan, Zapata, Sedco, and Global Marine, have developed special equipment including extremely large jackups and semisubmersibles capable of operating in low temperatures and with deckload capacity which permits infrequently resupply. You may also have read about special steel and concrete structural designs and gravel islands which have been jointly pursued by drilling contractors and major oil companies. The business investment has been large and I predict will grow substantially larger in the near future. Offshore Alaska will be a new North Sea but with different modes of conducting business.

Our industry looks forward to genuine coordination with the governments of the United States and Canada in the challenge ahead of successfully exploring the great reaches of the high seas.

In this regard, the safety responsibilities of the Coast Guard, as set forth in the OCS Lands Act, support the goal of promoting exploration and development of the OCS in an environmentally sound manner. We presume the excellent service of the

Coast Guard will continue and their role in Arctic areas will be well served with the maintenance of a superior icebreaking capability. With their present icebreaker fleet, they are an experienced, capable, and valued resource which can and should be called upon when the need arises.

As activity in the oil and gas industry accelerates in the Northern frontier, there is no doubt that existing Coast Guard icebreaking support services can be utilized. At the same time, private industry is moving ahead to provide much of its own icebreaking needs. We feel there is a place for both entities to work together as we strive to safely develop the resources of our Northern frontier.

STATEMENT OF M. R. WALSH, GENERAL MANAGER, MARINE SYSTEMS, CANADIAN MARINE DRILLING LTD.

Mr. Chairman, I am Captain Mal R. Walsh, General Manager Marine Systems Canadian Marine Drilling Ltd. (Canmar), and I am here today at your invitation to give this Committee a brief account of Canmar's icebreaker activities in the Canadian Beaufort Sea.

I have a short visual (slide) presentation which will show our current level of activity and equipment in the Canadian Beaufort which I will show after this brief outline of the Company I represent.

Canadian Marine Drilling Ltd. is a wholly owned subsidiary of Dome Petroleum Ltd. headquartered in Calgary, Alberta. Canmar is the operating arm for Dome's exploration activities in the Beaufort Sea and is responsible for the engineering, construction, operation and maintenance of drilling and support equipment in the Beaufort Sea area.

The Company began exploration drilling in 1976, and currently operates a fleet of four (4) ice-strengthened drillships for summer operations and a completely ice-strengthened mobile drilling caisson for year-round operations.

The drilling activity is supported and protected by a fleet of 17 vessels consisting of icebreakers, ice-strengthened supply vessels, tugs, survey and geotechnical vessels. In addition, we operate two offshore construction barges, plus fuel storage and material barges.

Canmar has developed major harbour facilities in the area complete with shore base infrastructures. These facilities include a ship repair complex consisting of a 30,000 ton floating dock and machine shop capable of accommodating any of our company's vessels in the Arctic.

We have extensive experience in ice management techniques developed through our icebreaker support to drilling and island building operations and through a continuing program of Arctic ship research.

Our icebreaker fleet allows extension of our drilling season from 95 day to 145 days by allowing early breakout from our winter harbour at McKinley Bay in late June, ice protecting and ice management duties during the "open water" season, mid-July to mid-October.

Late season (Fall) drilling continues in new forming winter ice, as late as November/December in some years with icebreakers then escorting the drillships back to winter lay-up.

Icebreaker activity continues with support to the S.S.D.C. (year-round drilling caisson) and various research and development projects. "Kigoriak" our major icebreaker has only recently (February 3rd) completed her missions and is now in winter lay-up, the last icebreaker to operate this season.

The priority areas of Arctic ship research that Canmar is currently concentrating on include:

1. Arctic Ships' Propulsion Safety: Establish ice design criteria for propulsion; establish ice loads exerted against propeller blades during ship operations in ice; and Canmar is doing full scale tests and is working with T.D.C. on this area of research.

2. Arctic Ships' Structural Integrity During Icebreaking Operations: Establish ice design criteria for ships' structures; establish ice forces exerted against a ship's hull during icebreaking operations; and Canmar has been conducting full scale "impact tests" with the Canmar Kigoriak since 1980, and is currently working with Canadian Coast Guard on this area of research.

3. Icebreaker support of Arctic Offshore Drilling Production and Transportation Systems.

4. Calibrating Scale Factor for Ice Model Tests with Full Scale Icebreaker Test Results.

5. Development of Operational Ice Hazard Detection, Monitoring and Prediction Systems for Arctic Marine Transportation Operations.

6. Demonstration of Year Round, Arctic Marine Transportation Feasibility (Arctic Shipping Assessment Project).

Canmar has been conducting research and development on these and other Arctic ship related areas since 1975. The most extensive and comprehensive Arctic ship R & D that the Company has conducted have been full scale tests with the Canmar Kigoriak and the Robert LeMeur, the Company's prototype icebreakers.

Other fields in which the Company has conducted R & D for Arctic Offshore operations include Oilspill Prevention and Clean-up, Arctic Tanker Development, Arctic Offshore Exploration and Production Structures, Subsea Pipelines, Sea Ice, Remote Sensing, Communications and Navigation, Permafrost Thaw Subsidence for Production and "Second Generation" Arctic Drillships.

I would like now to run through my short slide presentation which will demonstrate the action described so far. Following this, I will be happy to answer any questions you may have.

Thank you.

EXXON SHIPPING CO.,
Houston, Tex., March 14, 1984.

Hon. TED STEVENS,
Chairman, Senate Merchant Marine Subcommittee,
Hart Building, Washington, D.C.

DEAR SENATOR STEVENS: Exxon Shipping Company has followed with interest recent deliberations concerning the need for replacement of the older U.S. Coast Guard icebreakers. Exxon would expect to provide any icebreaking capability required to support its operations, should commercial petroleum reserves be found that require transportation by water. However, we are completely supportive of replacing existing older U.S. Coast Guard icebreakers required by the government to reliably provide the services (such as law enforcement and search and rescue) for which the Coast Guard has traditionally been responsible.

The attached letter concerning a "Polar Icebreaker Requirements Study" was recently forwarded to the U.S. Coast Guard. It would be appreciated if this letter were made a part of the record of your Subcommittee's deliberations.

Sincerely,

FRANK J. IAROSSI, *President.*

Attachment.

EXXON SHIPPING CO.,
Houston, Tex., February 28, 1984.

EXECUTIVE SECRETARY,
Polar Icebreaker Requirements Study,
U.S. Coast Guard Headquarters, Washington, D.C.

DEAR SIRS: These comments concern the U.S. Coast Guard's Polar Icebreaker Requirements Study, and are filed in response to the request published in 49 FR 2334, January 19, 1984. In that request, the USCG asked for "comments from commercial operators on their capabilities for providing traditional escort, rescue, and research icebreaking services to the government."

At this time, the ability of Exxon to supply such services to the government is nil. Future capability, if any, would exist only as an adjunct to production and transportation of oil and/or gas. Thus, the prerequisite for any "escort, rescue, and research icebreaking" support capability is the discovery of commercial reserves of hydrocarbons. Since such reserves have not yet been found, the current request is premature and any response must be speculative.

Should commercial reserves be found, Exxon (by itself or in cooperation with others) would naturally expect to provide the support facilities required to assure safe and economic production and transportation of hydrocarbons. In doing so, it is generally true that varying degrees of redundancy for backup and safety purposes will be required. During normal times, this redundance might be available for rescue or research icebreaking activities, but it is far too soon to say that such capability is assured. The availability of vessels for "escort services" is even more doubtful, since industry vessels will only be built as needed to meet industry requirements. Also, the USCG should recognize that there is no certainty the industry will be operating, or will have the ability to operate, in many of the areas for which the Coast Guard may be responsible. For example, vessel drafts may preclude operations in many areas.

In summary, Exxon would expect to have the redundancy required to assure its safe operations. Reliance on government services would be limited to those services

generally reserved to the government, such as police protection, navigation aids, search-and-rescue, and weather prediction. The possibility clearly exists that Exxon vessels would periodically be available to assist the government, but it is premature to speculate at this time regarding the nature of the equipment or the frequency of its availability.

Sincerely,

T. W. GILLETTE,
Senior Marine Consultant.

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